Oxylog 2000™

Emergency Ventilator

Operating Instructions
Software Version 3.n

MT 307-98

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Important Safety Information

Operator's Responsibility for Patient Safety

For correct and effective use of the product and in order to avoid hazards, it is mandatory to carefully read and to observe all portions of this manual.

The design of the equipment, accompanying literature, and the labeling on the equipment, take into consideration that the purchase and use of the equipment are restricted to trained professionals, and that certain inherent characteristics of the equipment are known to the trained operator. Instructions, warnings, and caution statements are limited, therefore, largely to the specifics of the Dräger design. This publication excludes references to various hazards which are obvious to a medical professional and operator of respiratory care equipment, to the consequences of misuse of such equipment, and to potentially adverse effects in patients with abnormal conditions. Product modification or misuse can be dangerous. Dräger, Inc. disclaims all liability for the consequences of product alterations or modifications, as well as for the consequences which might result from uses of the product not covered by its intended use or from the combination of this product with other products whether supplied by Dräger or by other manufacturers if such a combination is not endorsed by Dräger, Inc.

The operators of ventilator systems must recognize their responsibility for choosing appropriate safety monitoring that supplies adequate information on equipment performance and patient condition. Patient safety may be achieved through a wide variety of different means ranging from electronic surveillance of equipment performance and patient condition to simple, direct observation of clinical signs. The responsibility for the selection of the best level of patient monitoring lies solely with the equipment operator.

Limitation of Liability

Dräger, Inc.'s liability, whether arising out of or related to manufacture and sale of the goods, their installation, demonstration, sales representation, use, performance, or otherwise, including any liability based upon Dräger, Inc.'s Product Warranty, is subject to and limited to the exclusive terms and conditions as set forth, whether based upon breach of warranty or any other cause of action whatsoever, regardless of any fault attributable to Dräger, Inc. and regardless of the form of action (including, without limitation, breach of warranty, negligence, strict liability, or otherwise).

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Dräger, Inc. shall not be liable for, nor shall buyer be entitled to recover any special incidental, or consequential damages or for any liability incurred by buyer to any third party in any way arising out of or relating to the goods.

Warranty

All Dräger products are guaranteed to be free of defects for a period of one year from date of delivery. The following are exceptions to this warranty:

1. The defect shall be a result of workmanship or material. Defects caused by misuse, mishandling, tampering, or by modifications not authorized by Dräger, Inc. or its representatives are not covered.
2. Rubber and plastic components and materials are warranted to be free of defects at time of delivery.
3. Oxygen sensors capsules have a six-month limited warranty from the date of delivery.

Any product which proves to be defective in workmanship or material will be replaced, credited, or repaired with Dräger, Inc. holding the option. Dräger, Inc. is not responsible for deterioration, wear, or abuse. In any case, Dräger, Inc. will not be liable beyond the original selling price.

Application of this warranty is subject to the following conditions:

1. Dräger, Inc. or its authorized representative must be promptly notified, in writing, upon detection of the defective material or equipment.
2. Defective material or equipment must be returned, shipping prepaid, to Dräger or its authorized representative.
3. Examination by Dräger, Inc. or its authorized representative must confirm that the defect is covered by the terms of this warranty.
4. Notification in writing of defective material or equipment must be received by Dräger, Inc. or its authorized representative no later than two (2) weeks following expiration of this warranty.

In order to assure complete protection under this warranty, the Customer Registration Card and/or Periodic Manufacturer's Service Record (if applicable) must be returned to Dräger within ten (10) days of receipt of the equipment.

The above is the sole warranty provided by Dräger, Inc. No other warranty expressed or implied is intended. Representatives of Dräger are not authorized to modify the terms of this warranty.

Dräger, Inc., Telford, PA

Definitions

WARNING !

A WARNING statement refers to conditions with a possibility of personal injury if disregarded.

CAUTION !

A CAUTION statement designates the possibility of damage to equipment if disregarded.

NOTE: A NOTE provides additional information intended to avoid inconveniences during operation.

Inspection	=	examination of actual condition
Service	=	measures to maintain specified condition
Repair	=	measures to restore specified condition
Maintenance	=	inspection, service, and repair, where necessary
Preventive Maintenance	=	maintenance measures at regular intervals

Typing conventions in this manual

Controls (knobs, membrane switches) are designated as »**Control Name**«, e.g.

»**PEEP**«

Screen messages are printed in a window, e.g:

Self test O.K.

General WARNINGS and CAUTIONS

WARNING !

Strictly follow Operator's Instruction Manual!

Any use of the ventilator requires full understanding and strict observation of all portions of these instructions. The equipment is only to be used for the purpose specified under "Intended Use" (page 12). Observe all WARNINGS and CAUTIONS as rendered throughout this manual and on labels on the equipment.

WARNING !

DANGER, risk of explosion if used in the presence of flammable anesthetics.

The equipment is neither approved nor certified for use in areas where combustible or explosive gas mixtures with air or with nitrous oxide are likely.

WARNING !

Ventilation monitoring is mandatory at all times!

Whenever a patient is connected to the ventilator, constant attention by qualified medical staff is required in order to provide immediate corrective action in case of a malfunction.

The operator shall not rely on the built-in monitoring of the ventilator and must always assume full responsibility for proper ventilation and patient safety in all situations.

WARNING !

Keep manual resuscitation bag ready at hand!

If a defect is detected in the ventilator and its life-support functions can no longer be guaranteed (e.g. in case of a power failure or interruption in the medical gas supply), ventilation must be started without delay with an independent ventilation device (resuscitation bag) - using PEEP and/or increased inspiratory O_2 concentration as necessary.

WARNING !

Electrical connections to equipment which is not listed in these Operating Instructions should only be made after consultation with the respective manufacturers or a qualified expert.

CAUTION !

Restriction of Distribution

Federal Law and Regulations in the United States and Canada restrict this device to sale by or on the order of a physician.

CAUTION !

Accessories

Use only accessories listed in the Ordering Information (page 60).

CAUTION !

Federal law in the USA requires the traceability of this ventilator. If this device is resold, the new owner will have to inform the US distributor.

Precautions During Preparation

WARNING !

Always verify that valve membrane is installed in correct orientation. Ventilator malfunction will occur if silicone membrane is reversed.

Take care not to damage or bend rubber disc inside patient valve. Ventilator malfunction will occur.

WARNING !

Do not use electrically conductive patient circuits! They can pose a hazard to personnel and lead to ventilator damage during the use of a defibrillator!

WARNING !

A fully charged NiCd battery pack or fresh alkaline batteries must always be installed for safety reasons, even when operating from an external power supply!

WARNING !

Treatment of batteries:
- **Do not throw into fire!**
- **Do not force open!**
- **Do not attempt to recharge alkaline batteries!**

Danger of bodily injury.

Follow all local, state, and federal regulations with respect to environmental protection when disposing of batteries.

WARNING !

- **Always use extreme caution when using oxygen!**
- **Oxygen intensely supports any burning! No smoking, no open fire in areas where oxygen is in use!**
- **Always provide adequate ventilation in order to maintain ambient O_2 concentrations < 24 %.**
- **Use only officially approved gas cylinders that comply with federal and local regulations. Always secure gas cylinders against tipping, do not expose to extreme heat.**
- **Do not use oil or grease on O_2 equipment such as tank valves or pressure regulators. Do not touch with oily hands. Risk of fire!**
- **Open and close valves slowly, with smooth turns. Do not use any tools.**

WARNING !

Always use a pressure regulator with a vent valve at the outlet. This shall limit delivery pressure to approximately 70 psi in case of a defect!

WARNING !

Always use medical grade oxygen or air that is dry and free from dust and oil. Contaminated gas may cause ventilator malfunction.

WARNING !

Do not install flow control valves or flow meters into the high pressure gas supply. Equipment malfunction might result.

WARNING !

Ventilator is ready for operation only after all functional tests were performed successfully.

CAUTION !

Always use elbow connector for accurate flow measurement.

CAUTION !

Do not pressurize the connector for differential pressure sensing lines, the internal sensor may be destroyed

CAUTION !

Always use DC/DC converter 84 13 017 when using a DC source.

Precautions During Operation

WARNING !

Any use of the ventilator requires full understanding and strict observation of all portions of these Operating Instructions.

WARNING !

Always use ventilator that has been cleaned and disinfected and has been successfully tested to be ready for operation.

WARNING !

Observe pressure gauge in order to quickly identify improper ventilation. Operator must always be ready to avert danger to the patient.

WARNING !

To protect a patient with spontaneous breathing from toxic ambient air, use SIMV mode only !

WARNING !

If blender is not set to »No Air Mix«, toxic ambient air may be drawn from the environment.

Relocate patient immediately to an environment of breathable air, so that toxic air is not inspired when spontaneous breathing returns!

WARNING !

Only use CPAP mode for patients with sufficient spontaneous breathing.

WARNING !

The automatic "P_{aw} low" alarm for detecting a disconnection is not functional during CPAP!

Verify tightness of all connections!

WARNING !

Automatic ventilation, volume measurement, and alarms do not operate in the event of a power failure!

Spontaneous breathing can continue through the integrated demand valve.

Immediately start ventilating patient with independent manual ventilation device (resuscitation bag) using PEEP and/or increased inspiratory oxygen concentration where necessary and appropriate!

WARNING !

Continuous or intermittent audible alarms require immediate operator attention to avert or to prevent development of situations with the possibility of patient injury.

WARNING !

Do not block air intake. Ventilator malfunction will result.

Precautions During Care

WARNING !

Always follow accepted hospital / Electro-Magnetic Compatibility procedures for handling equipment contaminated with body fluids.

WARNING !

Water remaining in the patient valve or in the pressure sensing lines for flow measurement may cause ventilator malfunction.

CAUTION !

When removing patient circuits, always handle at end fittings! Otherwise, support helix may be torn at end fitting or hose and fitting could come apart.

CAUTION !

Do not allow any foreign objects to enter the flow sensor.

Do not use pressurized air for cleaning.
The orifice membrane inside the flow sensor may become damaged.

CAUTION !

Do not allow any foreign objects to enter the patient valve.

Do not damage the silicone diaphragm or other parts.

CAUTION !

Certain components of the ventilator consist of materials that are sensitive to certain organic solvents sometimes used for cleaning and disinfecting (e.g., phenols, halogen releasing compounds, oxygen releasing compounds, strong organic acids, etc.). Exposure to such substances may cause damage that is not always immediately apparent. Sterilization of the ventilator itself with ethylene oxide (EtO) is also not recommended.

CAUTION !

Follow all accepted hospital procedures for disinfecting parts contaminated by body fluids (protective clothing, eyewear, etc.).

CAUTION !

Do not use hard brush for cleaning.

Do not allow any foreign objects to enter the patient valve.

Precautions During Maintenance

WARNING !

To avoid any risk of infection, clean and disinfect ventilator and accessories before any maintenance according to established hospital procedures - this applies also when returning ventilators or parts for repair.

WARNING !

Preventive Maintenance work on the Oxylog 2000 ventilator may be performed by factory trained and authorized personnel only.

WARNING !

Treatment of batteries:
- **Do not throw into fire!**
- **Do not force open!**
- **Do not attempt to recharge alkaline batteries!**

Danger of bodily injury.

Follow all local, state, and federal regulations with respect to environmental protection when disposing of batteries.

WARNING !

Never operate a ventilator if it has suffered physical damage or does not seem to operate properly. In this case always refer servicing to factory trained and authorized personnel.

WARNING !

Damage to the LCD

If, in case of damage to the ventilator, the glass of the LCD screen is broken, a liquid chemical may escape which must not be allowed to come into contact with the human body. Immediately wash affected skin areas with soap.

CAUTION !

Maintenance

In case of malfunction of this device, contact your local Dräger Service or our Factory Authorized Technical Service Center.

The device must be inspected and serviced (preventive maintenance) by factory trained and authorized technical service representatives at regular intervals. A record must be kept on this preventive maintenance. We recommend obtaining a service contract through your vendor.

Maintenance or repair of Oxylog ventilators shall be performed only by Dräger authorized technical service representatives.

Intended Use

Oxylog 2000 - a time cycled, volume constant transport and emergency ventilator for patients with tidal volumes starting at 100 mL.

Available ventilation modes:

- Controlled Mandatory Ventilation (CMV) with variable I:E ratio and switch-selectable O_2 concentration of 100 or approximately 60% by vol.
- Assist/Control ventilation (A/C)
- Synchronized Intermittent Mandatory Ventilation (SIMV)
- spontaneous breathing with Continuous Positive Airway Pressure (CPAP)

with patient monitoring of:

- airway pressure P_{aw}
- expiratory minute ventilation MV

with ventilator monitoring of:

- airway pressure P_{aw}
- electrical power supply
- gas supply

with applications in:

- mobile emergency and primary care of emergency patients
- – patient transports in emergency rescue vehicles or by helicopter
- – patient transfers by road or air
- intra-hospital transports of ventilated patients
- – the emergency room
- – secondary transports between hospitals.

WARNING !

Ventilation monitoring is mandatory at all times!

Whenever a patient is connected to the ventilator, constant attention by qualified medical staff is required in order to provide immediate corrective action in case of a malfunction.

The operator shall not rely on the built- in monitoring of the ventilator and must always assume full responsibility for proper ventilation and patient safety in all situations.

WARNING !

Keep manual resuscitation bag ready at hand!

If a defect is detected in the ventilator and its life-support functions can no longer be guaranteed (e.g. in case of a power failure or interruption in the medical gas supply), ventilation must be started without delay with an independent ventilation device (resuscitation bag) - using PEEP and/or increased inspiratory O_2 concentration as necessary.

Overview

Controls

① The most important dial knobs, namely those for **ventilator rate (Rate)** and **tidal volume (VT)** are located in the center of the front panel. They are larger in diameter than the other dial knobs. Ranges for each patient group are color-matched on both knobs for easier presetting: infants (green), children (blue), adults (brown).

② The smaller dial knobs for **ventilation time ratio (I:E), maximum airway pressure (P_{max}),** and **end expiratory pressure (PEEP)**, are grouped together in one area. The PEEP knob features a safety stop for settings above 10 cmH_2O.

③ **Switch for CMV / A/C or SIMV / CPAP ventilation modes. The »☼ Info«** and **»🔔 Reset«** keys on the panel are used to change from CMV to Assist Control. Turning the rate knob to 0 changes from SIMV to CPAP.

④ The **ON/OFF switch »O/I«** is located beside the switch for the ventilation modes.
Both switches are protected by protruding U-brackets against accidental switching.

⑤ The **oxygen blender switch** is used to select either **100 % O_2 by vol.** or approx. **60 % O_2 by vol.** during ventilation.

⑥ Analog mechanical pressure gauge for continuous **display** of inspiratory and expiratory **airway pressure** – independent from electrical power supply.

⑦ The **liquid crystal display** is used for indicating measured MV, PEEP, Peak and Mean pressure, Rate, and $V_{Texp.}$, as well as for **Advisory** and **Warning messages**. It is located immediately above the two knobs for rate and tidal volume VT.
Alarms appear on the display as plain text. The red alarm status LED will start blinking simultaneously with an audible alarm.

⑧ Pressing the **»☼ Info«** key briefly displays additional settings and measured values.
This also activates screen backlighting.
Pressing the key for 3 seconds will test the display, status lights and audible alarm.

⑨ The audible alarm can be **silenced for approximately 2 minutes** by pressing the **»🔔 Reset«** key after an alarm has occurred.
When the alarm condition has been corrected, the alarm message can be reset by pressing this key.
A new, higher priority alarm will always be displayed immediately.

Supplies

Gas supply
O_2 from a cylinder with pressure regulator or from the **medical gas pipeline system**. Supply with medical air or from an optional O_2-Air blender in emergencies.

Power supply
Internal rechargeable NiCd battery pack and external power supply if necessary
or
Non-rechargeable alkaline battery pack and external power supply if necessary.

Preparation

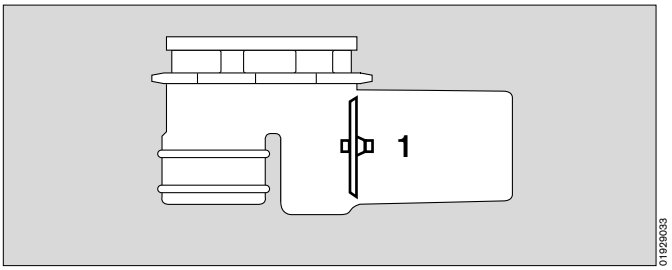
Assembly

Installing the patient valve

WARNING !

Always verify that valve membrane is installed in correct orientation. Ventilator malfunction will occur if silicone membrane is reversed.

1 Take care not to damage or bend rubber disc inside patient valve. Ventilator malfunction will occur.

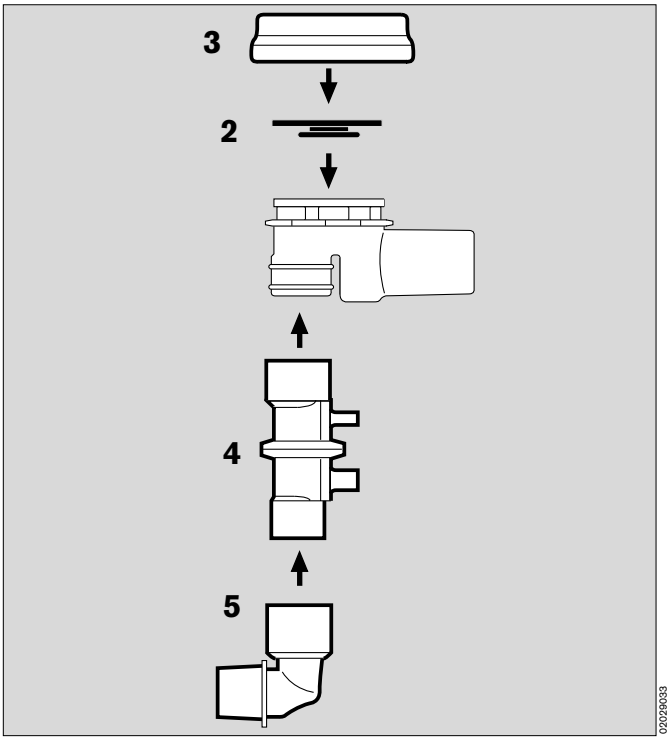


2 Place diaphragm in breathing valve – ensure that it is inserted correctly.

3 Install cover and turn approx. 90° clockwise = lock.

4 Plug flow sensor into breathing valve; note groove.

5 Attach elbow to flow sensor

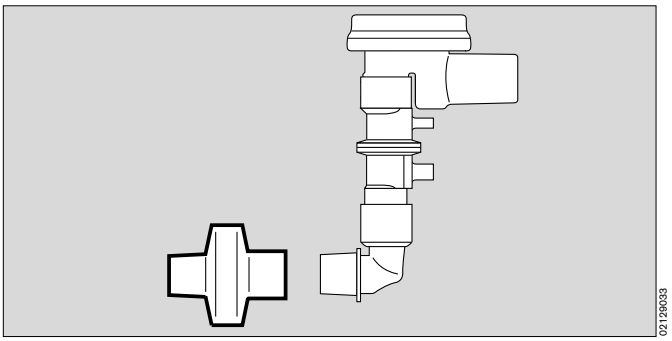


CAUTION !

Always use elbow connector for accurate flow measurement.

When using a bacteria filter

- always attach bacteria filter to elbow as shown.

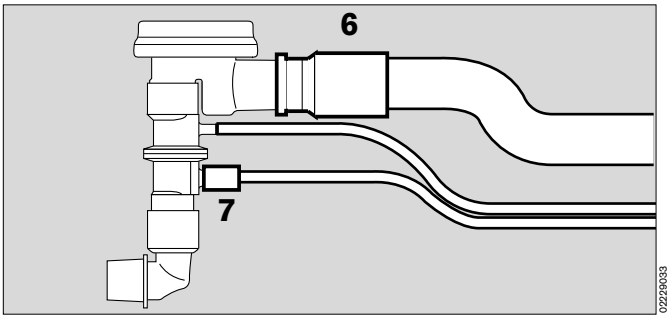


6 Connect ventilation hose to breathing valve.

WARNING !

Do not use electrically conductive patient circuits! They can pose a hazard to personnel and lead to ventilator damage during the use of a defibrillator!

7 Connect pressure lines for flow measurement to nipples on flow sensor – note different diameters.



Pneumatic Connections

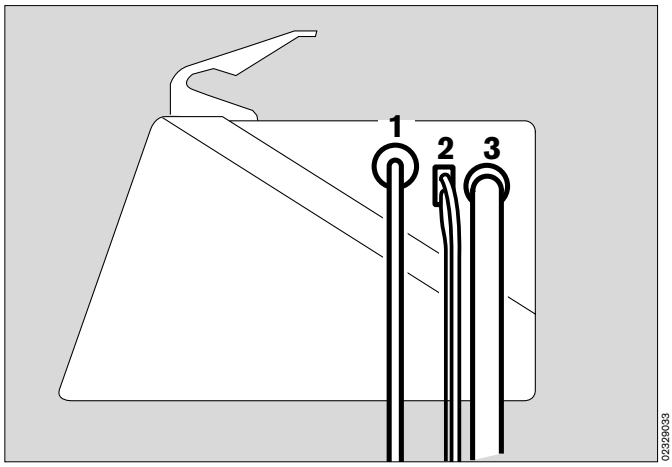
1 Attach gas supply line and hand-tighten DISS nut.

2 Attach pressure sensing lines for flow measurement to connector on Oxylog 2000.

CAUTION !

Do not pressurize the connector for differential pressure sensing lines, the internal sensor may be destroyed.

3 Connect patient circuit to port on Oxylog 2000.



Electrical Supply

The Oxylog 2000 ventilator is designed for different types of electrical supply.

Internal supply

with either rechargeable (NiCd)
or
non-rechargeable (alkaline) batteries

External supply

To recharge the NiCd battery pack and as auxiliary supply to extend operation when using alkaline or NiCd battery packs:

DC from an on-board supply system using a DC/DC converter (part no. 84 12 071)
or
AC adapter (part no. 84 12 709) from 115 V AC line voltage.

WARNING !

A fully charged NiCd battery pack or fresh alkaline batteries must always be installed for safety reasons, even when operating from an external power supply!

Installing / replacing NiCd battery pack

- before first use
- when the display message

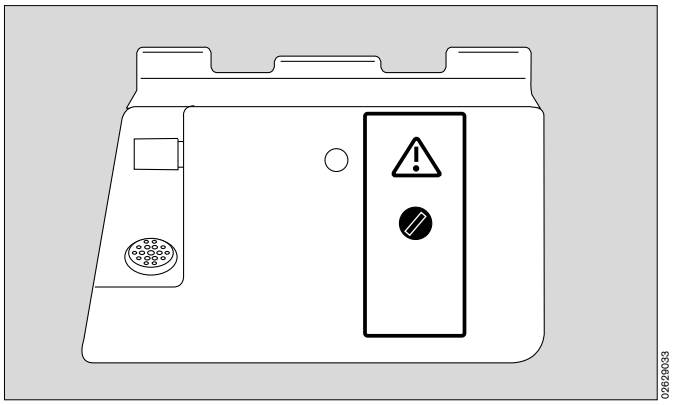
Faulty NiCd

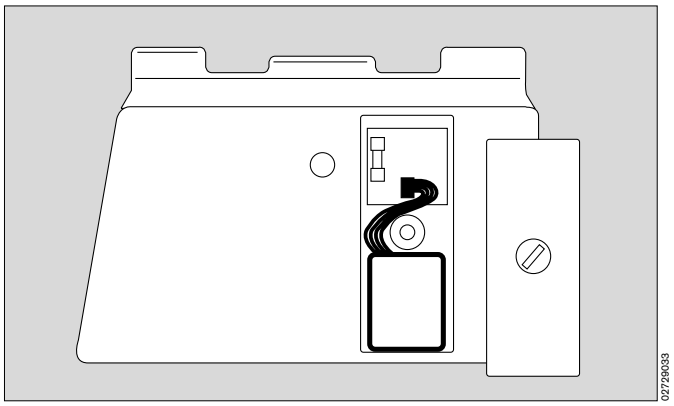
  appears during charging,

  and

- as part of preventive maintenance every 2 years.

- Undo screw in battery compartment cover (use coin) and remove cover.
- Take out defective battery pack and disconnect plug.
- Attach plug of new battery pack to receptacle in battery compartment and insert pack.
- Re-install cover and tighten screw.





WARNING !

Treatment of batteries:
- **Do not throw into fire!**
- **Do not force open!**
- **Do not attempt to recharge alkaline batteries!**

Danger of bodily injury.

Follow all local, state, and federal regulations with respect to environmental protection when disposing of batteries.

Charging NiCd batteries

NOTE: Even while NiCd batteries are connected to an external power supply, they will slowly discharge. It takes about 2 years for batteries to discharge completely under those circumstances

NOTE: Always charge at ambient temperatures of 0°C to 35°C (32°F to 95°F)!

Alternatively, charge battery pack with

- on-board DC supply
  Always use DC/DC converter 84 12 071

or

- AC adapter.
  Always use AC adapter 84 12 709 for connecting device to 115 V AC line voltage.

When external voltage is connected:

- The green DC power status LED lights up regardless of whether the ventilator is switched on or off. The internal battery pack is now being charged.
- Display while ventilator is switched off:

Stand-by **NiCd charging**

- It takes approximately 8 hours to fully charge a completely discharged NiCd battery pack
- Display while ventilator is turned off:

Stand-by **NiCd charged**

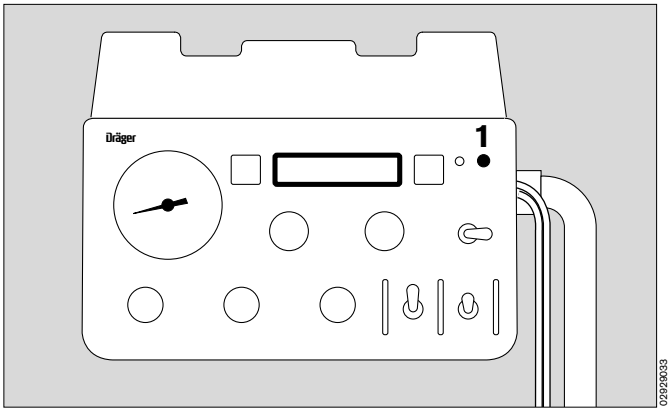
At room temperature, the ventilator can be operated for approximately 6 hours with a fully charged NiCd battery pack.

- Near the end of battery capacity, the following display will appear:

Charge NiCd

Approximately 10 minutes of operation remain at the time of this message.

NOTE: Low ambient temperatures and the actual condition of the rechargeable batteries may reduce operating times, see "Technical Data" page 54.

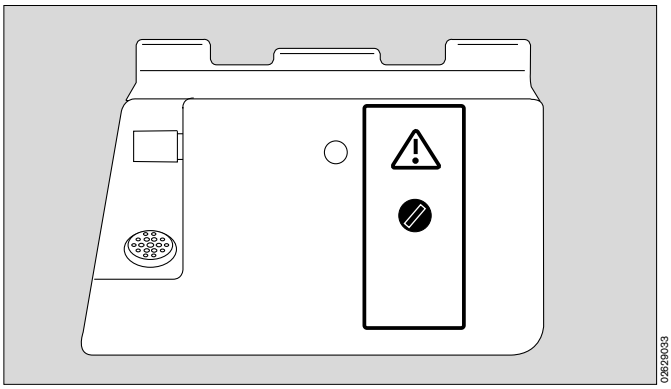


Operation with alkaline batteries

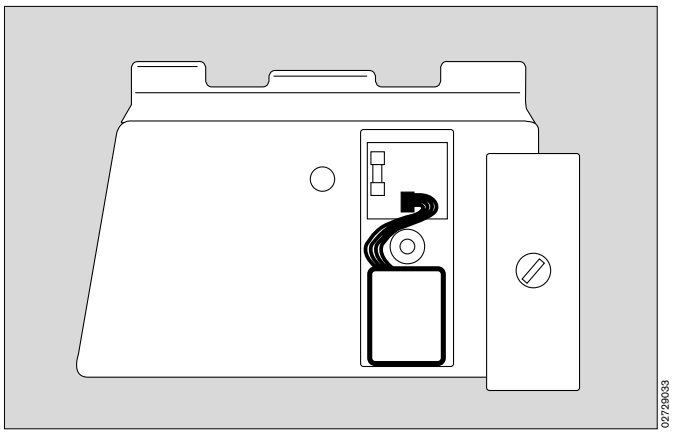
With battery holder 18 35 505

Only use alkaline batteries, type IEC LR6 (AA size)

- Undo screw in lid of battery compartment (use coin) and remove lid.



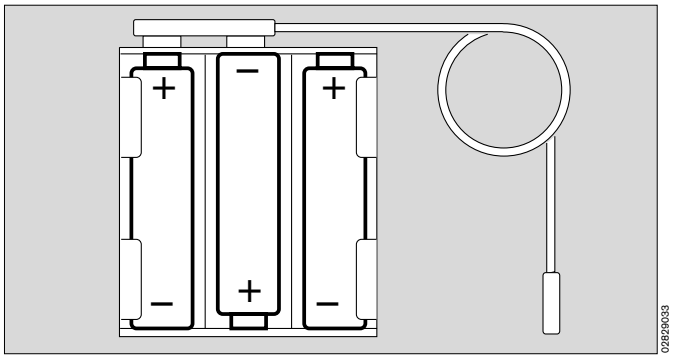
- Take out pack of discharged alkaline AA batteries (or discharged NiCd battery pack, respectively) and disconnect.



- Remove discharged batteries from battery holder, clip in six new batteries.

NOTE: Ensure correct polarity when inserting new batteries.

- Re-attach plug of battery pack to receptacle in battery compartment and insert pack.
- Install cover and tighten screw.



WARNING !

Treatment of batteries:
- **Do not throw into fire!**
- **Do not force open!**
- **Do not attempt to recharge alkaline batteries!**

Danger of bodily injury.

Follow all local, state, and federal regulations with respect to environmental protection when disposing of batteries.

The ventilator can be operated for approximately 4 hours with a pack of fresh alkaline batteries.

An additional external supply can be connected to extend the electrical operation time:

- Use a DC/DC converter (part no. 84 12 071) or
- use an AC adapter (part no. 84 12 709).

For display messages related to batteries, see table "Troubleshooting" on pages 45 and 46.

External power supply from AC adapter

- Only use AC power supply 84 12 709!
- Connect power plug to 115 V outlet and DC plug to DC socket on Oxylog 2000.

Operation with external DC supply

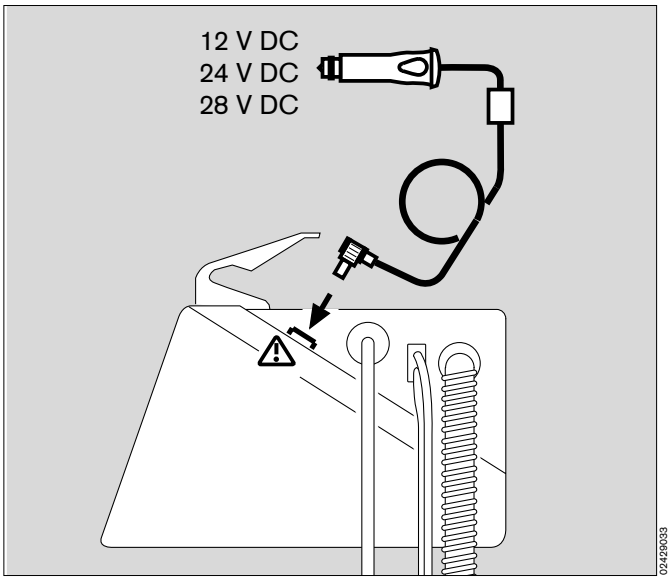
CAUTION !

Always use DC/DC converter 84 12 071 when using a DC source.

Voltage fluctuations in on-board supplies can be significant, e.g. due to varying load conditions. They may exceed the input tolerances specified for Oxylog 2000.

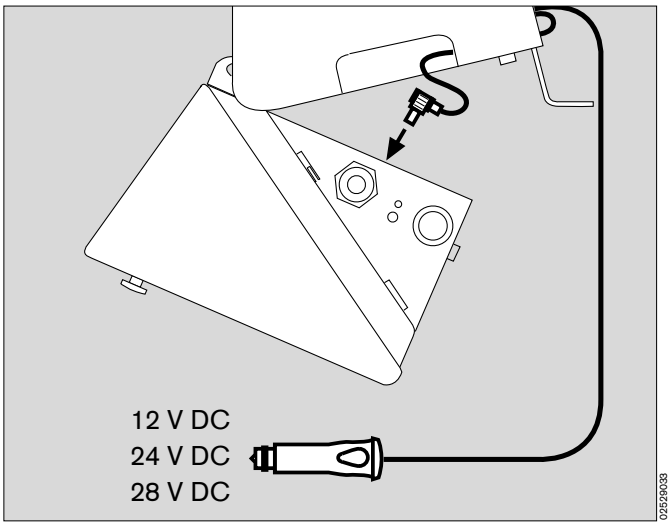
The DC/DC converter conditions these types of DC power sources to provide a constant voltage of approximately 12 V DC.

- Attach cigarette lighter adapter plug to on-board DC power source, plug other end into external DC input jack on top of ventilator.



DC converter operation in combination with ventilator mount bracket:

- Plug angled connector into Oxylog external DC input jack. Attach cigarette lighter adapter plug to an on-board socket.



Connecting DC/DC converter to on-board supply without cigarette lighter adapter

NOTE: The following procedure to be performed by a qualified technician only.

Cut the on-board cable to required length. Remove capacitor from the cigarette lighter adapter plug and reinstall to connect positive and negative cable leads. (Capacitor is needed for continued immunity of converter against electromagnetic interference.)

Connect cable leads to on-board supply with correct polarity:

red = positive
blue = negative

Positioning the Oxylog 2000

For stationary use

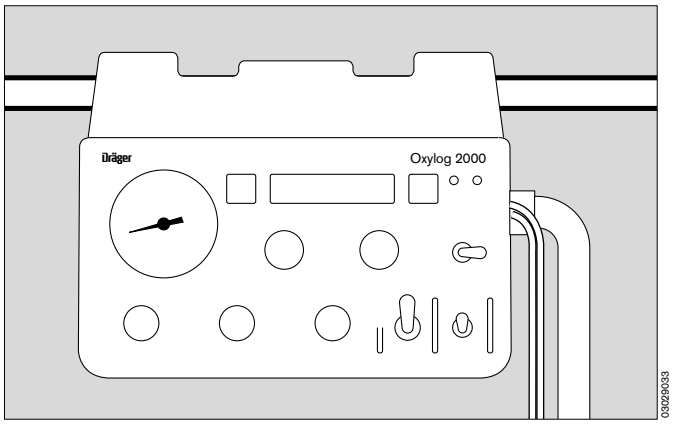
- Place on a level surface where it cannot slide or fall,

or

- hang from the headboard of a bed,

or

- hang from a wall rail.



For mobile use in ambulances

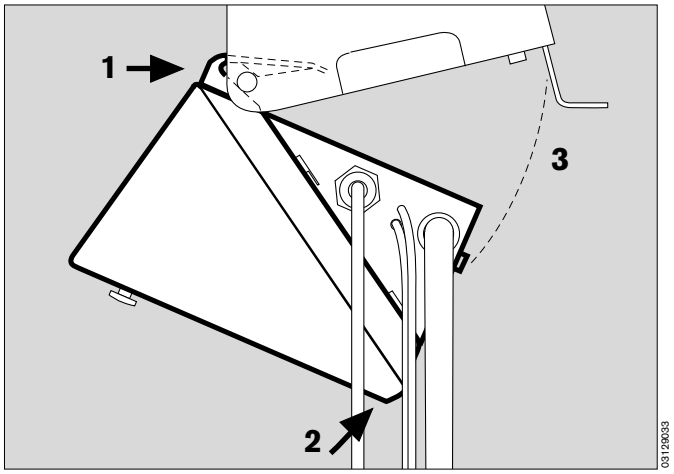
- Attach Oxylog 2000 to ventilator mount bracket (accessory 84 12 069).

1 Hang ventilator handle on bar of mounting bracket.

2 Swing rear of ventilator up to engage locking mechanism.

To remove ventilator:

3 Push lever from below to disengage bracket.



Connecting Gas Supply

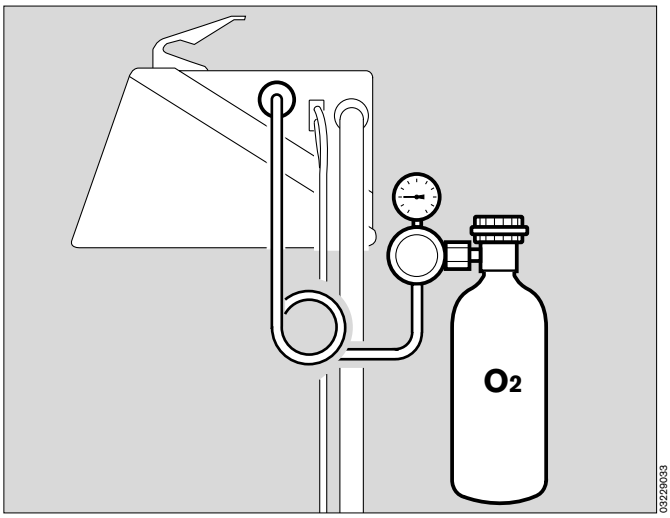
WARNING !

- **Always use extreme caution when using oxygen!**
- **Oxygen intensely supports any burning! No smoking, no open fire in areas where oxygen is in use!**
- **Always provide adequate ventilation in order to maintain ambient O_2 concentrations < 24 %.**
- **Use only officially approved gas cylinders that comply with federal and local regulations. Always secure gas cylinders against tipping, do not expose to extreme heat.**
- **Do not use oil or grease on O_2 equipment such as tank valves or pressure regulators. Do not touch with oily hands. Risk of fire!**
- **Open and close valves slowly, with smooth turns. Do not use any tools.**

Supply from an oxygen cylinder

Always use a full cylinder (tank pressure 2400 psi).

- Attach pressure regulator for delivery pressure of 40 to 88 psi (= 2.7 to 6.0 bar, nominal pressure 50 psi) to oxygen cylinder.



WARNING !

Always use a pressure regulator with a vent valve at the outlet. This shall limit delivery pressure to approximately 70 psi in case of a defect!

WARNING !

Always use medical grade oxygen or air that is dry and free from dust and oil. Contaminated gas may cause ventilator malfunction.

WARNING !

Do not install flow control valves or flow meters into the high pressure gas supply. Equipment malfunction might result.

- Connect Oxylog 2000 to pressure regulator to medical gas supply hose.
- Turn cylinder valve **slowly** and open fully.

Determining gas supply in O_2 cylinder

Example:

Cylinder pressure measured on the pressure gauge of the pressure regulator: 2400 psi

Supply of pressurized O_2 (E-cylinder): 622 L

Estimate for expected time of operation of Oxylog 2000

Example:

CMV mode, ventilator rate 10 bpm, V_T = 1 L

minute ventilation = 10 bpm x 1 L = 10 L/min

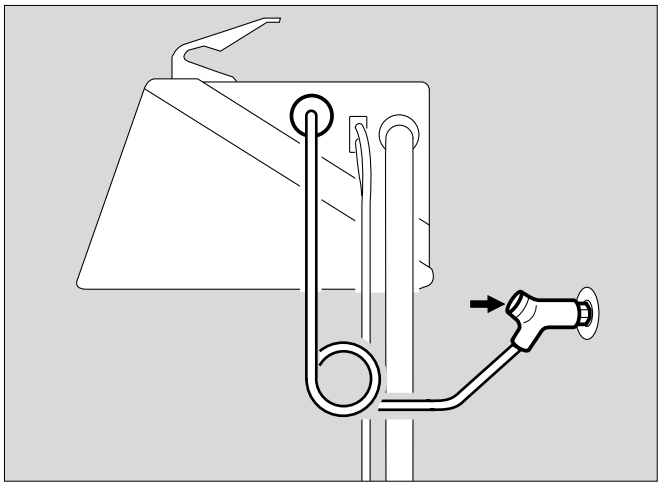
$$\text{Time of operation} = \frac{\text{Medical gas supply [L]}}{\text{(MV +1*) [L/min]}}$$

$$\text{Time of operation} \quad \frac{622}{11} = \text{approx. 56 minutes}$$

NOTE: Gas consumption is reduced by approximately 50 % and the time for operation increases to approximately 110 minutes when Oxylog 2000 is switched to "Air Mix".

Supply with oxygen from wall pipeline

- Attach high pressure hose with DISS connector to Oxylog 2000 and connect to wall terminal with appropriate quick connect probe.



Supply from O_2-air blender

- Note supply pressures for O_2 and medical gas input:

  40 to 88 psi (4.0 to 6.0 bar)

Carrying system 2000

The carrying system 2000 is recommended for quick mobile use of the Oxylog 2000:
Accommodates the Oxylog 2000 ventilator, O_2 cylinder with pressure regulator, accessory bag and circuit holder – for immediate use of the ventilator,
see "Ordering Information".

---

* Gas consumption of ventilator: approximately 1 L/min

Checking Readiness for Operation

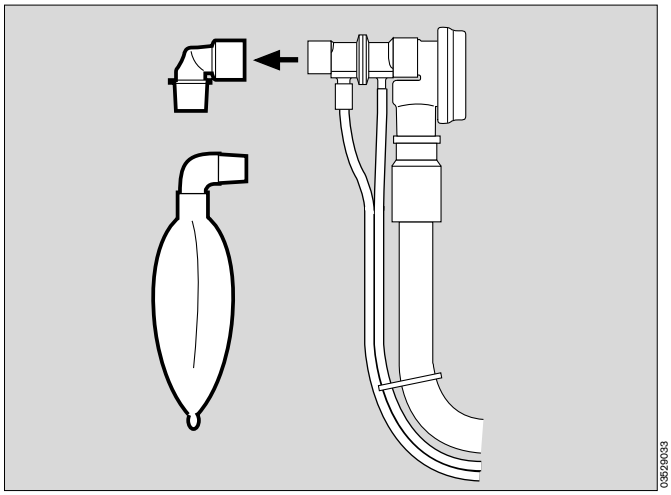
- after exchanging the patient valve
- after cleaning and reassembly
- at least every 6 months.

NOTE: Always log checks for documentation purposes.

Connecting a Test Lung (part no. 84 03 201)

The test lung consists of an elbow for attaching the wye, an ET-tube adapter size 7 mm for simulation of airway resistance, and a 2 L ventilation bag for simulation of compliance.

- Remove elbow from flow sensor.
- Insert test lung elbow to patient connector at flow sensor.



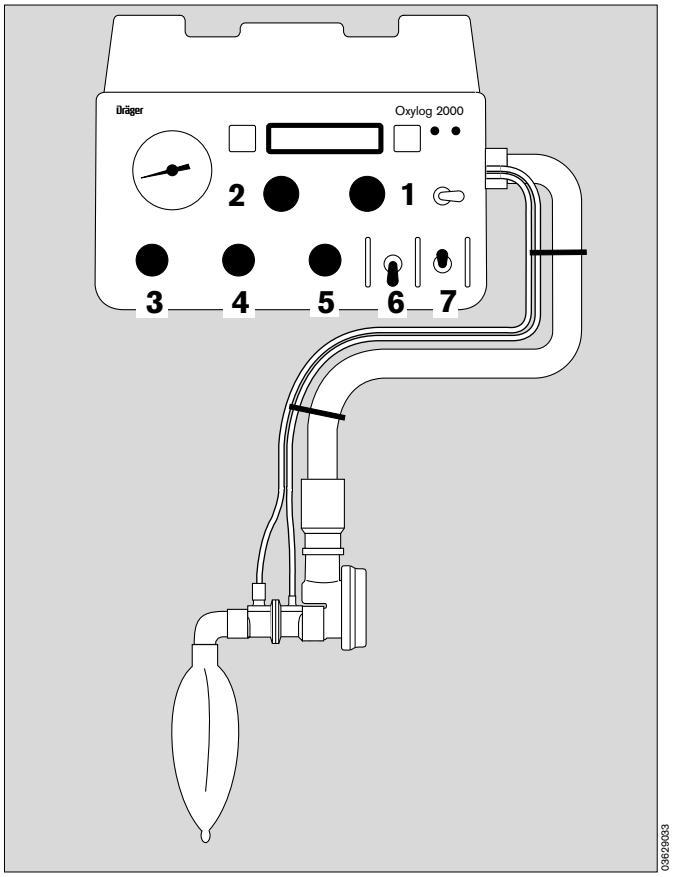
Connect gas supply:

- Open gas cylinder valve slowly and completely,

or

- engage gas supply hose to wall terminal with quick connect probe.

Checking Ventilation



1 Set knob »**VT**« to 0.5 L.

2 Set knob »**Rate**« to 12 bpm.

3 Set knob »**I:E**« to 1:2.

4 Set knob »**Pmax**« to 60 cmH_2O.

5 Set knob »**PEEP**« to 5 cmH_2O.

6 Set switch for ventilator modes to »**CMV**«.

7 Switch ventilator »**On**«.

- The ventilator will now perform an electric and pneumatic self test.
- Display:

Self test **Software xx.xx**

The software version is shown in the bottom line.

- The red alarm status light and the LCD backlighting will be turned on briefly.
- The audible alarm will sound twice.

NOTE: For safety reasons, the audible alarm output uses two channels which are both tested during the self test. Therefore two audible alarms of the same duration will be heard.

- The green DC power status light » ⊙ « (DC power ok.) will be lit continuously as long as an external power source of 11 to 13 V DC is connected.

The self test will be completed after no more than 6 seconds

- Display:

Self test O.K.

- Oxylog 2000 will now ventilate the test lung with the set ventilation pattern.

- Alternating between inspiration and expiration, the pressure gauge should indicate a consistent inspiratory pressure and the preset end-expiratory pressure of approximately 5 cmH2O.
- The display should now shows a minute ventilation of

  CMV MV = 6.0

  with a tolerance of ±1.0 L/min.

- Disconnect test lung.
- Display after approximately 25 seconds:

  CMV MV = 0.0
  Paw low

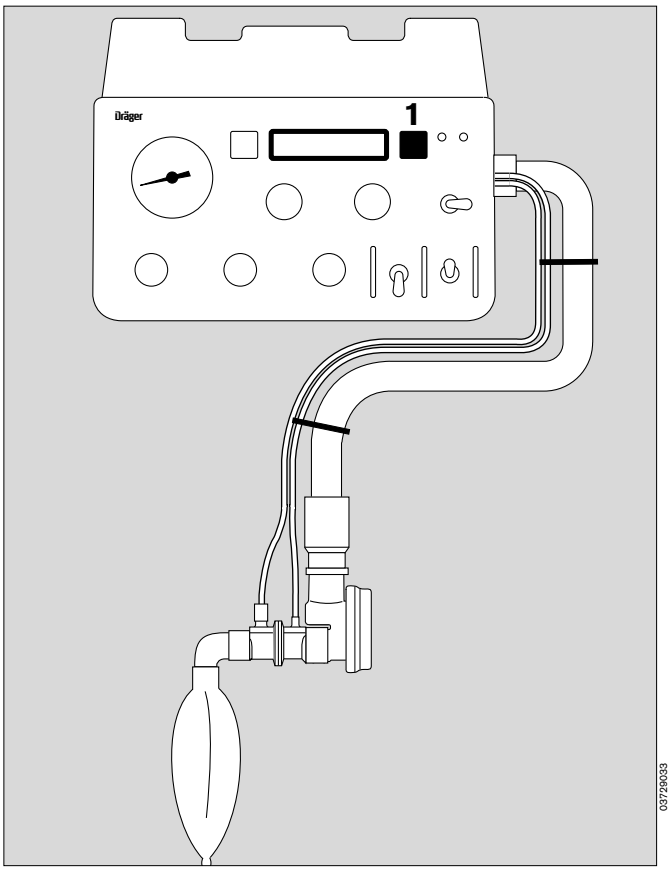
  together with an intermittent audible alarm.

- Reconnect test lung.
- The intermittent audible alarm tone should stop after approximately 25 seconds.

1 Press »🔔 **Reset**« to clear the display.

If values are outside tolerance:

- Replace flow sensor.



Checking End-Expiratory Pressure (PEEP)

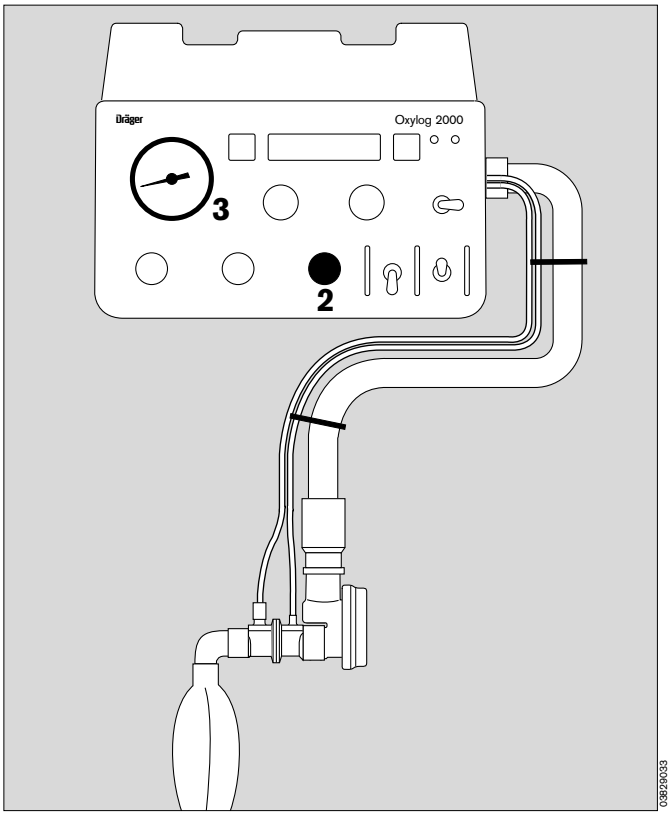
2 Set »**PEEP**« knob to 0 cmH2O.

3 Reading on pressure gauge at end of expiration:
0 cmH2O +2 cmH2O tolerance.

2 Set »**PEEP**« knob to 10 cmH2O.

3 Reading on pressure gauge at end of expiration:
10 cmH2O ±2 cmH2O tolerance.

2 Set »**PEEP**« knob back to 0 cmH2O.



Checking »Paw high« Alarm

1 Set »**VT**« knob to 1.0 L.

2 Set »**Rate**« knob to 5 bpm.

3 Set »**I:E**« knob to 2 : 1.

4 Set »**Pmax**« knob to 40 cmH2O.

- Keep test lung compressed and watch pressure gauge.
- At an airway pressure of 36 to 40 cmH2O, the ventilator should switch to expiration, deflating the test lung.

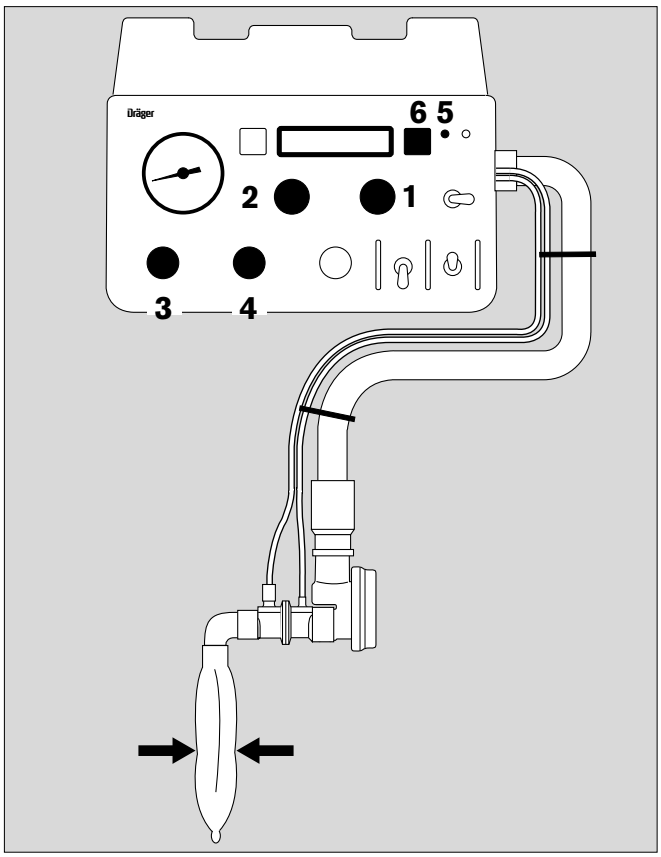
5 The red alarm status light starts flashing and the following message will appear on the display:

Paw high

together with an intermittent audible alarm.

- Release test lung.
- The audible alarm will stop.

6 Press »🔔 **Reset**« to clear the display.



Checking »Paw low« Alarm

Using the previous settings:

- Disconnect test lung from patient valve.

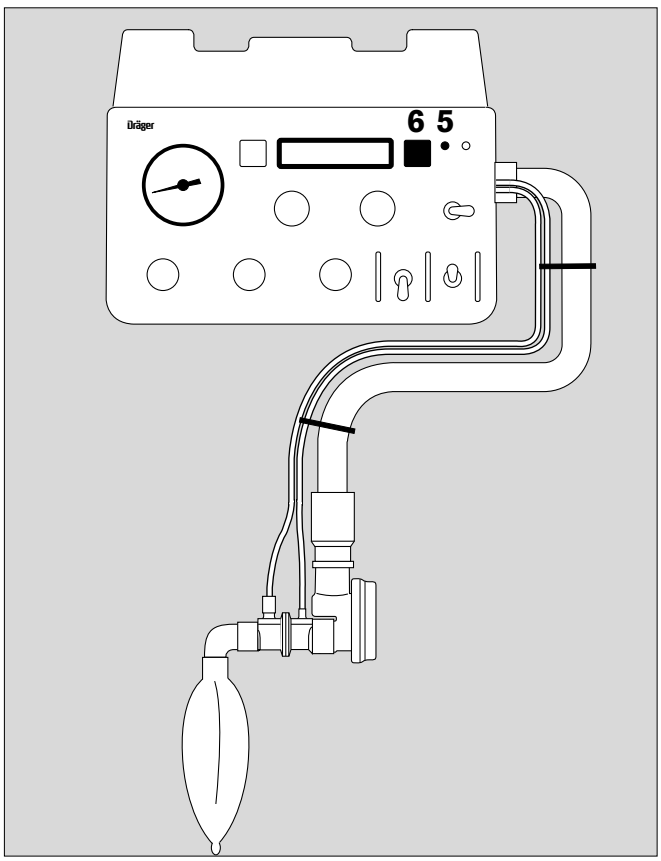
5 After approximately 25 seconds, the red alarm status light starts flashing and the following message will appear on the display:

Paw low

together with an intermittent audible alarm.

- Reconnect test lung.
- The intermittent audible alarm will stop after approximately 25 seconds.

6 Press »🔔 **Reset**« to clear the display.



Checking SIMV Synchronization

1 Set switch for ventilation modes to **SIMV**.

2 Set »**Pmax**« knob to 60 cmH2O.

3 Set »**PEEP**« knob to 10 cmH2O.

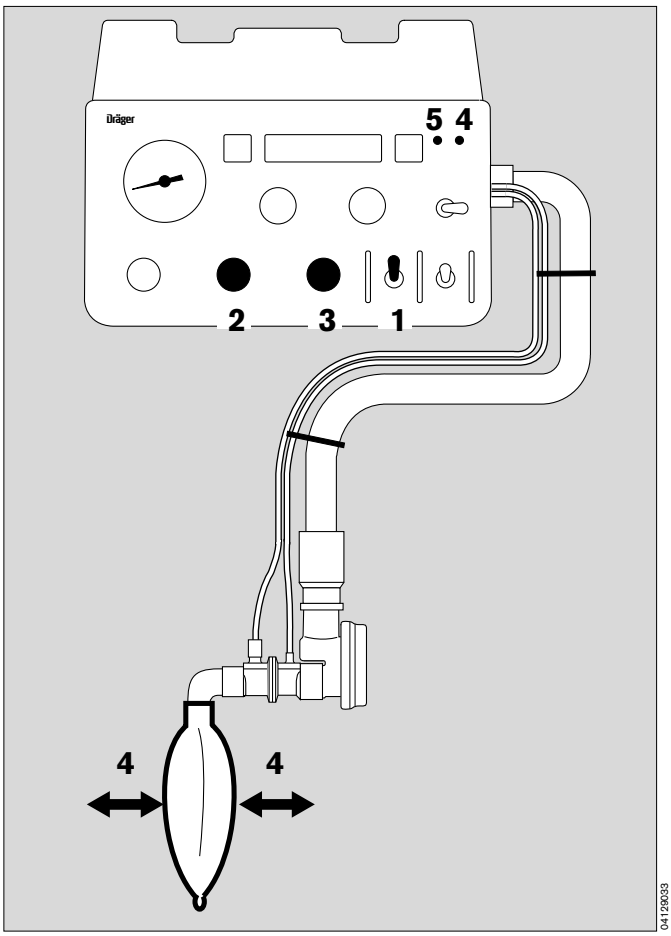
4 Compress and release test lung several times to simulate spontaneous breathing.

- A synchronized ventilator breath should occur within approximately 5 seconds. Synchronizing was successful when a star-symbol (*) is showing in the display behind the measured value.
  Example:

  SIMV MV = 6.0 *

1 Set switch for ventilation modes to **CMV / A/C**.

3 Set »**PEEP**« knob to 0.



Checking Power Failure Alarm

Use the above settings.

4 Connect external power supply (power supply unit or DC/DC converter).The green LED lights up.

Interrupt external power supply:

5 The red alarm status light will start blinking, the green LED goes out.

The following message appears on the display:

Mains supply down

together with an intermittent audible alarm.
The ventilator continues operation with the internal battery pack.

- Press »🔔 **Reset**« to clear the display.
  The intermittent tone stops.
  The message »Main supply down« disappears.
- Reconnect external power supply = set ON/OFF switch to **0**.

WARNING !

Ventilator is ready for operation only after all functional tests were performed successfully.

- Disconnect test lung, replace elbow connector.

Operation

Pre-Use Checklist

WARNING !

Any use of the ventilator requires full understanding and strict observation of all portions of these Operating Instructions.

Check before start-up

	OK?
Either cylinder pressure equals at least 1500 psi or ventilator connected to medical gas pipeline system	☐
Power supply verified: fully charged pack of rechargeable (NiCd) or new alkaline batteries If external power supply: either connected to line power or to on-board power supply	☐
All tubing connected	☐

Function check

Connect test lung to patient valve ☐

Dial knobs: **V_T** to 0.5 L
Rate to 12 bpm
I:E to 1: 2
P_{max} to 60 cmH_2O
PEEP to 5 cmH_2O

Switch for ventilation modes set to **CMV**

ON/OFF switch to **I**:

Display: **Self test**
SW-version xx.xx

Red alarm status lights up briefly
Alarm tone sounds twice
Green LED lights up with external power supply

After approx. 6 seconds

Display: **Self test OK** ☐

Oxylog 2000 ventilates the test lung ☐

Test "P_{aw} low" alarm: Remove test lung ⟶ alarm after approx. 20 seconds ☐

Test "P_{aw} high" alarm: Re-attach test lung and compress ⟶ alarm ☐

For error messages, see "Troubleshooting", page 45 in these Operating Instructions

Functional check completed successfully ☐

WARNING !

Always use ventilator that has been cleaned and disinfected and has been successfully tested to be ready for operation.

"Care", page 40
"Preparation", page 14
"Checks of Readiness for Operation", page 23

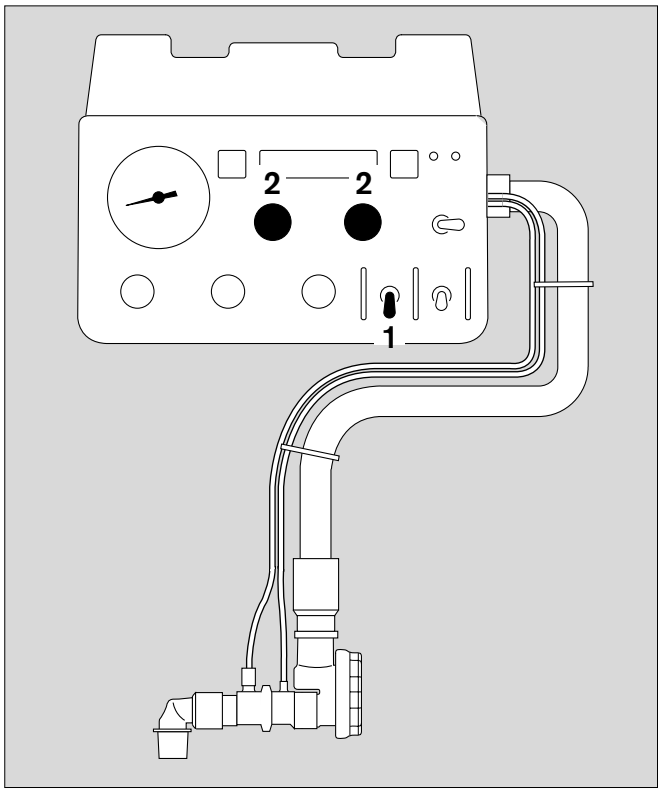
Using CMV

CMV = Controlled Mandatory Ventilation

For ventilator rates of 5 to 40 bpm.

NOTE: The Oxylog 2000 ventilator limits the minimum ventilator rate to 5 bpm during CMV.

1 Set switch for ventilator modes to CMV



NOTE: For quick pre-setting you may set knobs »Rate« and »V_T« to **matching colors** on dial scale. This will adjust ventilation parameters to settings for infant, pediatric, and adult patients, respectively.

2 Set »**Rate**« and »**V_T**« knobs.

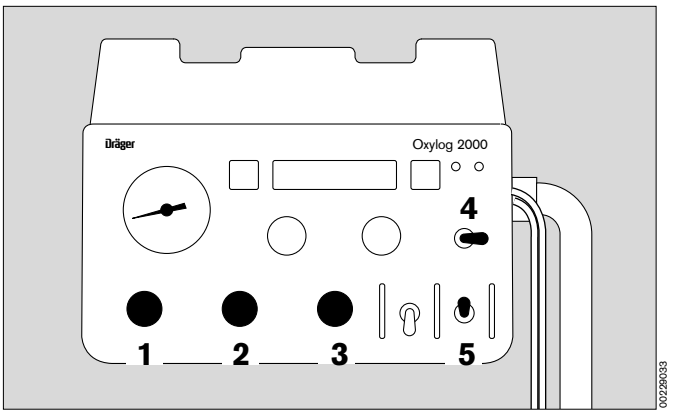
Body weight (kg)	**Rate** (bpm)	**V_T** (L)
Green range: infants (7.5 to 20)	30 to 40	0.1 to 0.3
Blue range: children (20 to 40)	20 to 30	0.3 to 0.8
Brown range: adults (over 40)	5 to 20	0.8 to 1.5

1 Set »**I:E** knob to 1 : 1.5.

2 Set »**Pmax**« knob initially to 60 cmH2O.

3 Set »**PEEP**« knob initially to 0 cmH2O *.

4 Use blender switch to set the required O2 concentration:
Air Mix ≈ 60 % O2 by vol.**
or
No Air Mix = 100 % O2 by vol.



NOTE: Due to the physical properties of the injector used for mixing the applied tidal volume VT is reduced in case of high airway pressure in air mix mode.

- Increase the tidal volume VT in accordance with the measured minute ventilation MV.

5 ON/OFF switch set to I.
Display:

Self test **SW-version xx.xx**

When the patient is connected:

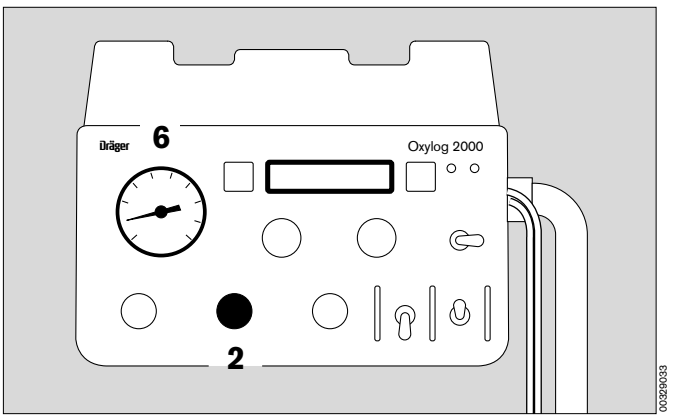
- Check displayed minute ventilation MV and adjust settings to suit the patient.

The following display appears if expiratory minute ventilation is less than 1 L/min:

CMV MV = 0

6 Read maximum airway pressure Paw on the pressure gauge.

2 Set »**Pmax**« knob to approx. 10 cmH2O higher than the maximum airway pressure.



If the airway pressure in the range of settings between 20 and 60 cmH2O exceeds the maximum airway pressure »**Pmax**«, the ventilator immediately switches to expiration to protect the patient and displays the warning message:

Paw high

The set tidal volume VT cannot be fully applied!

---

* The end-expiratory pressure may equal up to 2 cmH2O even when PEEP = 0 is set.

** See also page 58.

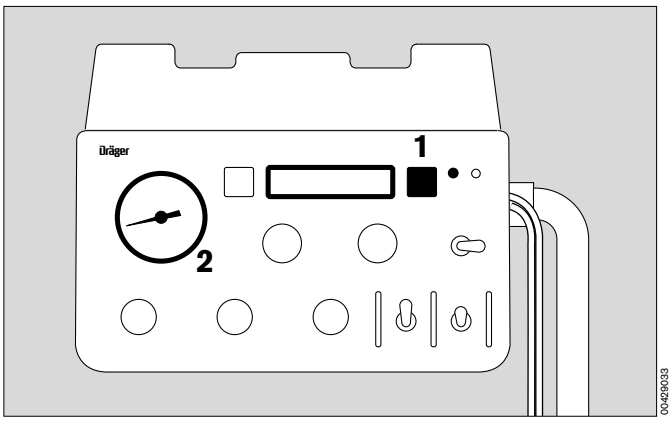
If airway pressures are too high and there is a "P_{aw} high" alarm:

- Check tube position.
- Check patient airways, suction if necessary.
- Verify that ventilation circuit is not kinked.

To clear alarm message from the screen:

1 Press »🔔 **Reset**« key.

2 Observe pressure gauge.



WARNING !

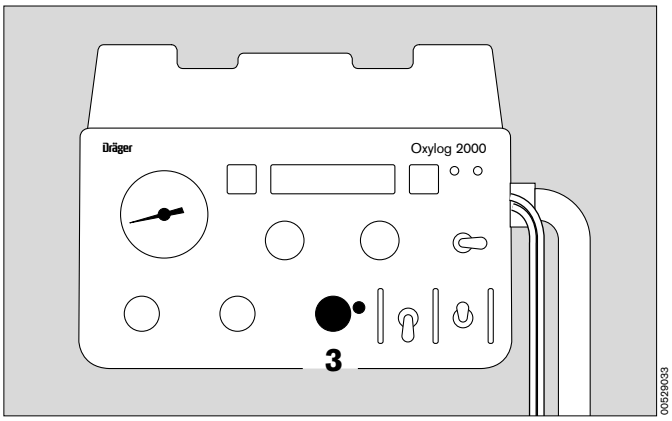
Observe pressure gauge in order to quickly identify improper ventilation. Operator must always be ready to avert danger to the patient.

Applying PEEP

3 Set »**PEEP**« knob to required value and check result on pressure gauge.

The range of PEEP values higher than 10 cmH_2O is mechanically protected. To override the stop:

- Push back metal pin in dial scale while turning the knob pointer over the pin.
  Perform the same when returning to PEEP values below 10 cmH_2O.



For cardiopulmonary resuscitation

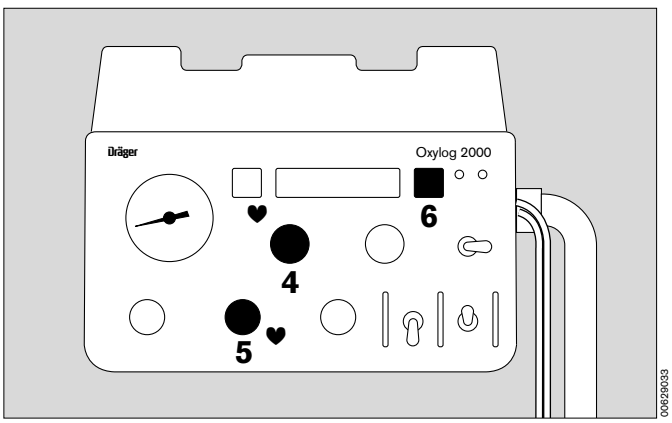
When applying cardiac massage for adult patients with the aid of an assistant:

4 Set »**Rate**« knob to ♥ = 12 breaths per minute.

5 Set »**Pmax**« knob to ♥ = pressure limited to 80 cmH_2O.

Display:

Pmax= 80 cmH_2O CPR



6 Press »🔔 **Reset**« to clear display.

The airway pressure is limited to max. 80 cmH_2O without interrupting inspiration prematurely (ventilation with limited pressure).
A single beep advises that pressure limitation is active.

Using Assist/Control

In Assist/Control mode (A/C), the patient may trigger the controlled ventilator breaths within a time period (trigger window). Ventilator breaths will then be synchronized with the patient's inspiratory effort!

NOTE: In this mode, the resulting ventilation rate is higher than that set on the ventilator.

Ventilator breaths are automatically applied at the set rate if there is no patient inspiratory effort.

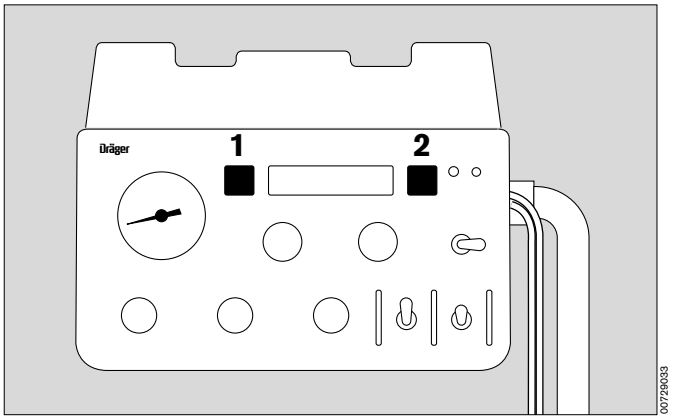
- Set ventilation initially as described for CMV mode, pages 29, 30.
  Then:

1 Press »☼ **Info**« key to obtain the display:
CMV → A/C.

2 Press »🔔 **Reset**« to confirm and Assist/Control mode is applied by the ventilator.

The maximum inspiratory time is always limited to 1.3 seconds. The following alarm message appears if the measured rate exceeds the set frequency by more than 50 %:

High rate



Using SIMV

SIMV = Synchronized IntermittentMmandatory Ventilation

SIMV is a combination of mechanical ventilation and spontaneous breathing, with spontaneous breathing possible between mandatory ventilator breaths.
If the patient does not breathe spontaneously within a certain time period, the ventilator automatically applies a mechanical breath.

A 6 second trigger window is kept open when setting low ventilation rates. This will guarantee a minimum expiratory time of 0.5 seconds. The duration of the trigger window decreases as the frequency of mechanical breaths increases.

With synchronization, mechanical breaths are applied during a trigger time window that is calculated to coincide with the patient's inspiratory effort. The frequency of the mechanical breaths remains constant. Synchronization is briefly indicated by a star (*) in the display.

For rates of 5 to 40 bpm:
The mechanical breaths and their time parameters are determined by the ventilator rate set for SIMV/CPAP:

»**Rate**« setting	Effect
0	No mechanical breaths → CPAP (page 35)
5 to 18.5 bpm	Fixed inspiratory time = 1.3 s
18.5 to 40 bpm	Fixed I : E = 1 : 1.5

1 Set switch for ventilation modes to »**SIMV/CPAP**«.

Adjust pattern of mandatory ventilator breaths by setting:

2 knobs »**VT**« and »**Rate**«.

NOTE: Preferred rates are less than 10 bpm. This will allow the patient sufficient time for spontaneous breathing.

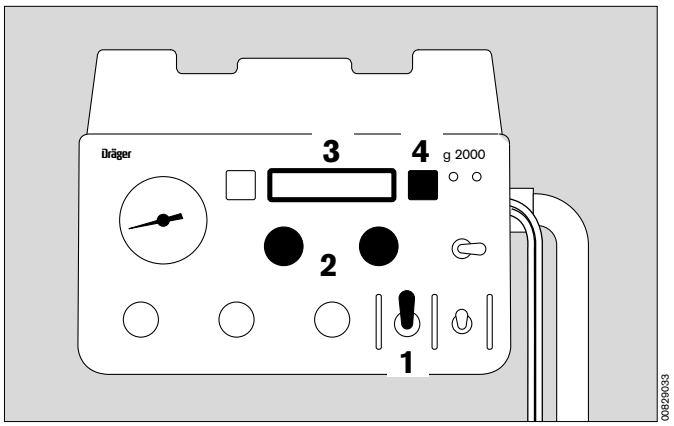
3 Display:

Tinsp = 1.3 s

if the rate had been set lower than 18.5 bpm, or

I:E = 1 : 1.5

if the rate had been set higher than 18.5 bpm.



To clear the display:

4 Press »**Reset**«.

The following message appears if the expiratory minute ventilation is less than 1 L/min:

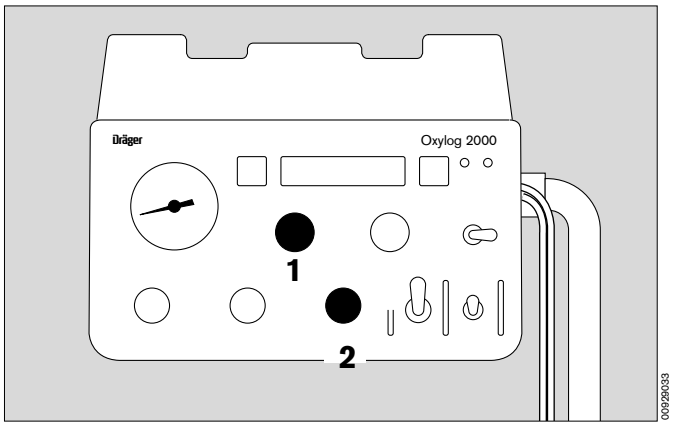
SIMV MV = 0

NOTE: Pure oxygen is supplied during spontaneous breathing, even when the ventilator is set to **»Air Mix«** .

1 Reduce the ventilation frequency via the »**Rate**« knob when spontaneous breathing resumes.

NOTE: At rate settings lower than 5 bpm, the ventilator will switch to CPAP.

2 Use »**PEEP**« knob to set the positive airway pressure.



Use in toxic environments

WARNING !

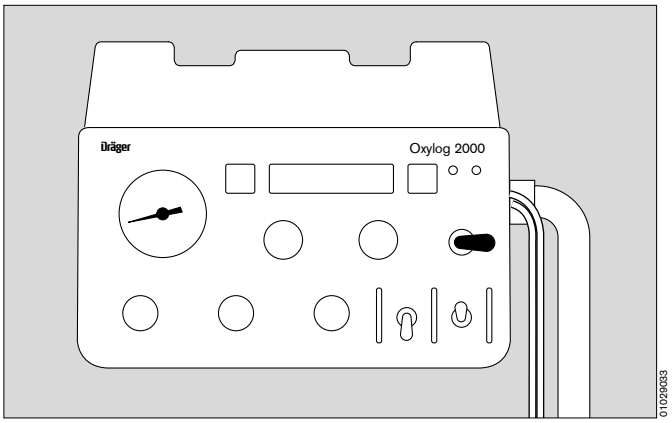
To protect a patient with spontaneous breathing from toxic ambient air, use SIMV mode only !

- Set blender switch to »**No Air Mix**«.

WARNING !

If blender is not set to »No Air Mix«, toxic ambient air may be drawn from the environment.

Relocate patient immediately to an environment of breathable air, so that toxic air is not inspired when spontaneous breathing returns!



Using CPAP

CPAP = Spontaneous breathing with positive airway pressure

WARNING !

Only use CPAP mode for patients with sufficient spontaneous breathing.

Check spontaneous breathing on the pressure gauge: During inspiration. the patient must be able to produce a negative pressure of at least 2 cmH_2O below PEEP.

1 Set »**Rate**« knob to 0.

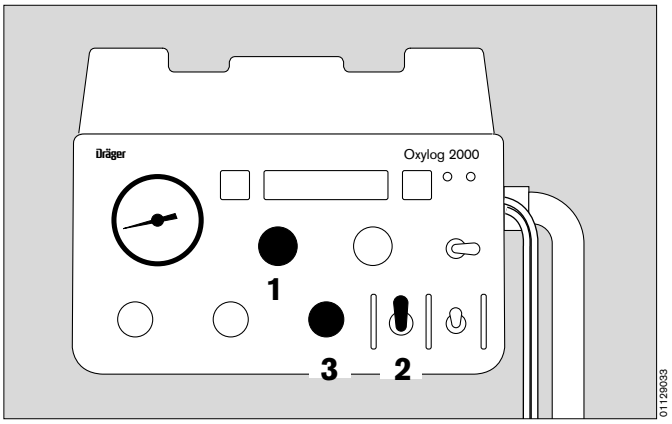
2 Set switch for ventilation modes to »**SIMV/CPAP**«.

3 Set »**PEEP**« knob to required positive airway pressure.

NOTE: The spontaneous minute ventilation is always applied with 100 % O_2 by vol. during CPAP. The setting of the »**Air Mix/No Air Mix**« switch has no effect in this mode of operation.

When spontaneous breathing is insufficient:

- change to SIMV or CMV / A/C.



WARNING !

The automatic "Paw low" alarm for detecting a disconnection is not functional during CPAP!

Verify tightness of all connections!

Displaying Settings and Measured Values

The ventilation mode and expiratory minute ventilation MV are continuously shown in the top line of the display.

Specific ventilation parameters appear in the bottom line of the display, depending on the ventilation mode set (examples):

For CMV / Assist/Control

Inspiratory time	**Tinsp = 2.0 s**
Inspiratory flow	**FLOW = 30.0 L/min**
Mean pressure	**MEAN = 15.0 cmH2O**
End-expiratory pressure	**PEEP = 5.0 cmH2O**
Peak pressure	**PEAK = 20.0 cmH2O**
Respiratory rate (A/C only)	**Frequency = 10 bpm**

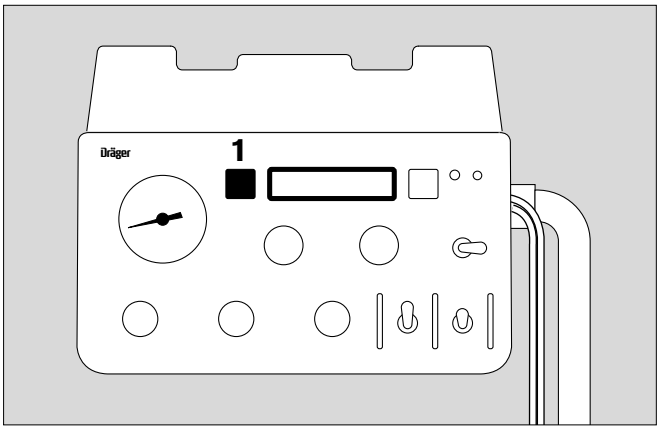
For SIMV

Inspiratory flow	**FLOW = 30.0 L/min**
Mean pressure	**MEAN = 15.0 cmH2O**
Endexpiratory pressure	**PEEP = 5.0 cmH2O**
Peak pressure	**PEAK = 20.0 cmH2O**
Respiratory rate	**Frequency = 10 bpm**
Tidal volume	**VTexp. = 450 mL**

For CPAP

Positive airway pressure	**CPAP = 8.0 cmH2O**
Respiratory rate	**Frequency = 10 bpm**
Tidal volume	**VTexp. = 450 mL**

In the event of an alarm, the parameters displayed in the bottom line will be "overwritten" by the alarm messages.



Displaying measured values:

1 Briefly press »☼ **Info**« key.

NOTE: An alarm message cannot be reset until its cause has been corrected.

A message which has not been cleared will be overwritten by a new message of higher priority.

In the Event of a Power Failure

WARNING !

Automatic ventilation, volume measurement, and alarms do not operate in the event of a power failure!

Spontaneous breathing can continue through the integrated demand valve.

Immediately start ventilating patient with independent manual ventilation device (resuscitation bag) using PEEP and/or increased inspiratory oxygen concentration where necessary and appropriate!

Alarms

In the event of an alarm

1 The red alarm status will light up / will flash,

– the audible alarm will sound, either continuously, intermittently or as a single beep (every 30 seconds),

– an alarm message will appear on the second line of the backlit display.

● Assess the audible alarm:
Continuous or intermittent tone = Urgent! Immediate action is required!

Single beep (every 30 seconds) = Advisory message.

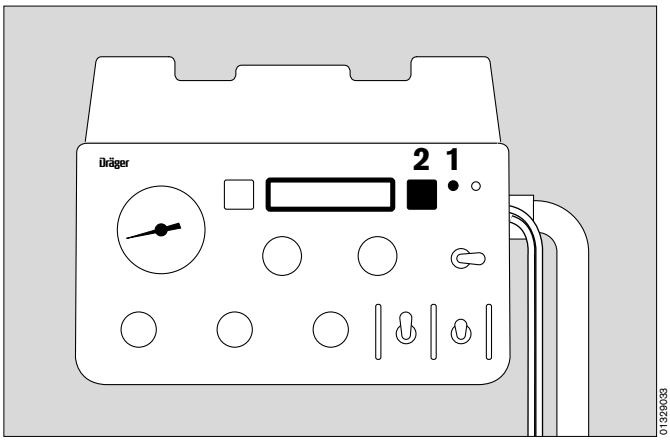
WARNING !

Continuous or intermittent audible alarms require immediate operator attention to avert or to prevent development of situations with the possibility of patient injury.

● Read alarm message in display and correct condition using the guidelines from chapter "Troubleshooting" on pages 45, 46.

NOTE: The audible alarm may be silenced for 2 minutes during an alarm:

2 Press »🔔 **Reset**« key.
If the alarm situation persists, the audible alarm will resume after 2 minutes – or immediately if a new, higher priority alarm occurs.



When an alarm condition has been corrected:

- The red alarm status light will go out and the audible alarm will stop.

To clear an alarm message from the screen:

- Press »🔔 **Reset**« key.

NOTE: An alarm message cannot be reset as long as the condition causing it has not been corrected. A message that has not been reset yet will, however, be overwritten by a new message of higher priority.

Time Limits for Battery Powered Operation

Oxylog 2000 can be operated for approximately six hours with a fully charged NiCd battery pack.

NOTE: The 6 hour estimate may have to be reduced when loss of battery capacity has occurred over time.

Oxylog 2000 can be operated for approximately 4 hours with new alkaline batteries.

See pages 21, 22 for calculating pneumatic operating time capacities for different gas cylinders.

When batteries near the end of capacity, the display will show, respectively:

Charge NiCd

or

Change bat.

Approximately 10 minutes of operation remain at the time of these messages.

NOTE: The display backlighting cannot be switched on during this time.

If necessary:

- ventilate patient with self-inflating manual resuscitation bag,
- install new alkaline battery pack (see pages 18,20),

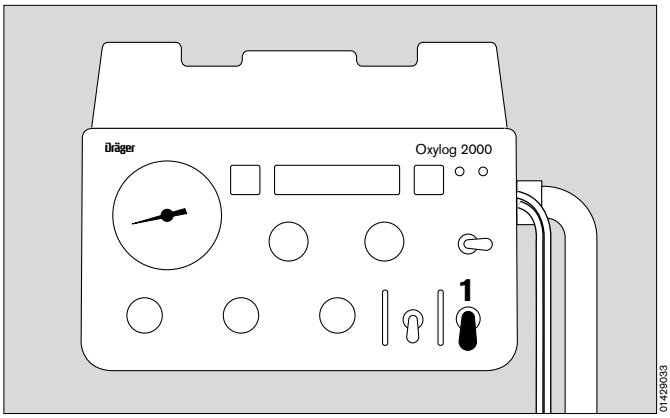
or

connect ventilator to external power supply (see pages 15, 19).

End of Operation

After disconnecting patient:

1 Set »**ON/OFF**« switch to O.



When oxygen is supplied from a cylinder:

- Completely close cylinder valve.

With oxygen supply from wall oxygen system:

- Disconnect high pressure hose quick connect probe from wall terminal.

Storage of ventilator for an extended period of time

When Oxylog is not going to be used for more than 3 months:

- Remove alkaline battery pack (where applicable)

NOTE: Rechargeable batteries may remain in the ventilator.

Care

- Always clean and disinfect expiration valve and (reusable) patient circuit after each use.
- Clean ventilator and high pressure hoses according to established hospital / EMC procedures and/or visual check of cleanliness.

Disassembly

WARNING !

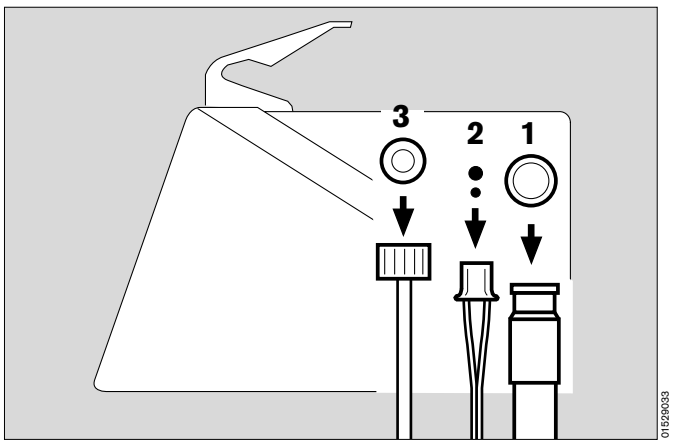
Always follow accepted hospital / EMC procedures for handling equipment contaminated with body fluids.

- Remove Oxylog 2000 from ventilator mount bracket (where applicable).

1 Remove patient circuit from nozzle.

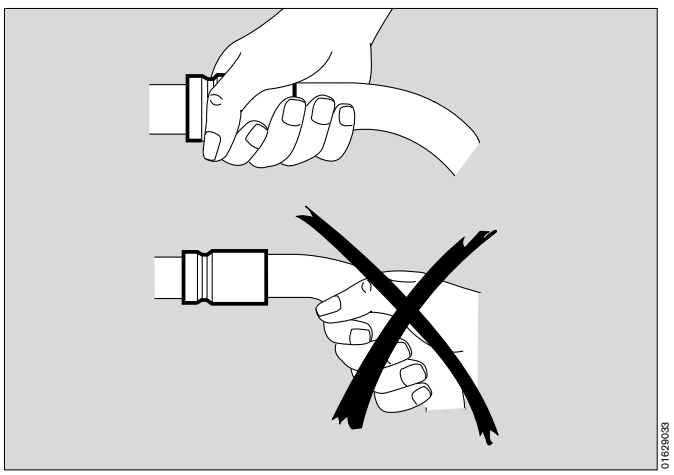
2 Remove connector for pressure sensing hoses (flow measurement) from ventilator.

3 Unscrew DISS high pressure oxygen hose from Oxylog 2000.



CAUTION !

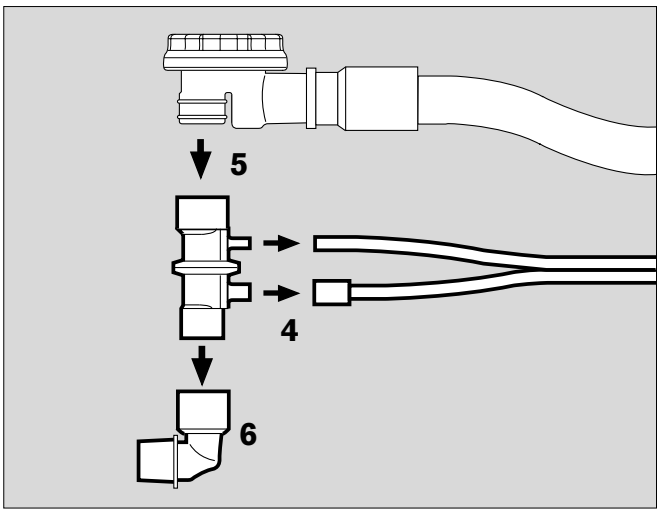
When removing patient circuits, always handle at end fittings! Otherwise, support helix may be torn at end fitting or hose and fitting could come apart.



4 Remove pressure sensing hoses for flow measurement from flow sensor.

5 Pull flow sensor from ventilator valve - do not twist while removing.

6 Pull elbow connector from flow sensor.



CAUTION !

Do not allow any foreign objects to enter the flow sensor.

Do not use pressurized air for cleaning.
The orifice membrane inside the flow sensor may become damaged.

- Detach patient valve from patient circuit.

Disassembling the patient valve

1 Turn cover 90 ° counterclockwise = disengage and remove.

2 Remove silicone diaphragm.

- Do not further disassemble the patient valve!

CAUTION !

Do not allow any foreign objects to enter the patient valve.

Do not damage the silicone diaphragm or other parts.

Cleaning / Disinfecting / Sterilizing

CAUTION !

Certain components of the ventilator consist of materials that are sensitive to certain organic solvents sometimes used for cleaning and disinfecting (e.g., phenols, halogen releasing compounds, oxygen releasing compounds, strong organic acids, etc.). Exposure to such substances may cause damage that is not always immediately apparent. Sterilization of the ventilator itself with ethylene oxide (EtO) is also not recommended.

CAUTION !

Follow all accepted hospital procedures for disinfecting parts contaminated by body fluids (protective clothing, eyewear, etc.).

To prevent any damage, we recommend that only detergents and disinfectants are used that are compatible with the materials used in the ventilator and its accessories, e.g. surface disinfectants on the basis of aldehydes, alcohol, or quarternary ammonia compounds for disinfection of the main unit.

Ensure that all disinfectants are registered with the U.S. Environmental Protection Agency for use as intended. Always follow the instruction labels specifically with respect to prescribed concentrations and the necessary exposure times.

Wipe Disinfection:

Use for ventilator and high pressure hose.

- Disinfect by wiping all surfaces following disinfectant manufacturer's instructions regarding concentrations and application.

Bath disinfection:

Use for disassembled parts of the patient valve, flow sensor, ventilator circuit (where applicable), pressure sensing hoses for flow measurement.

- Disinfect by immersion in disinfectant solution, following manufacturer's instructions. Move parts thoroughly.

CAUTION !

Do not use hard brush for cleaning

Do not allow any foreign objects to enter the patient valve.

- Remove parts after the recommended exposure time and rinse thoroughly with distilled water.
- Shake water out and let parts dry completely before reassembling.

WARNING !

Water remaining in the patient valve or in the pressure sensing lines for flow measurement may cause ventilator malfunction.

Sterilization procedures

Where referenced in established hospital / EMC procedures:

- Disassembled parts of the patient valve, flow sensor, reusable ventilator circuit (where applicable), pressure sensing hoses for flow measurement may be steam autoclaved at 134°C (273°F).

After cleaning and disinfecting

- Re-assemble (page 14),
- connect power and gas supply (pages 15, 20),
- check readiness for operation (page 23).

Maintenance

CAUTION !

Maintenance

In case of malfunction of this device, contact your local Dräger Service or our Factory Authorized Technical Service Center.

The devices must be inspected and serviced (preventive maintenance) by factory trained and authorized technical service representatives at regular intervals. A record must be kept on this preventive maintenance. We recommend obtaining a service contract through your vendor.

Maintenance or repair of Oxylog ventilators shall be performed only by Dräger authorized technical service representatives.

WARNING !

To avoid any risk of infection, clean and disinfect ventilator and accessories before any maintenance according to established hospital procedures - this applies also when returning ventilators or parts for repair.

User Replaceable Parts

Batteries

Internal alkaline battery pack	replace, if message »Bat. discharged« or »Change bat.« is displayed
Internal NiCd battery pack	replace, if message »defective NiCd« is displayed during charging, every 2 years at the latest

WARNING !

Treatment of batteries:
- **Do not throw into fire!**
- **Do not force open!**
- **Do not attempt to recharge alkaline batteries!**

Danger of bodily injury.

Follow all local, state, and federal regulations with respect to environmental protection when disposing of batteries.

Preventive Maintenance Intervals

WARNING !

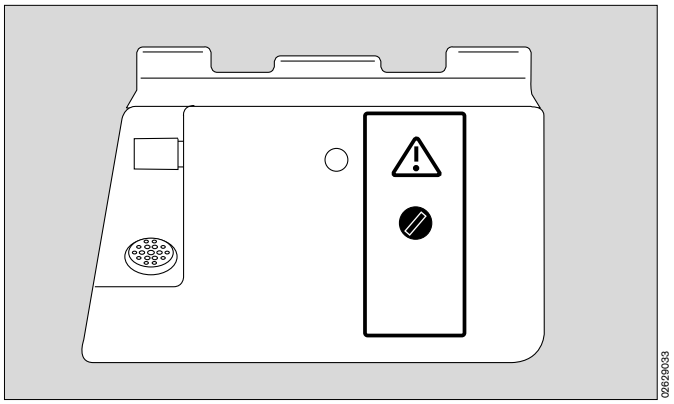
Preventive Maintenance work on the Oxylog 2000 ventilator may be performed by factory trained and authorized personnel only.

Scheduled safety checks	every 2 years
Inspection and prev. maint.	every 2 years
Pressure regulator overhaul	every 6 years

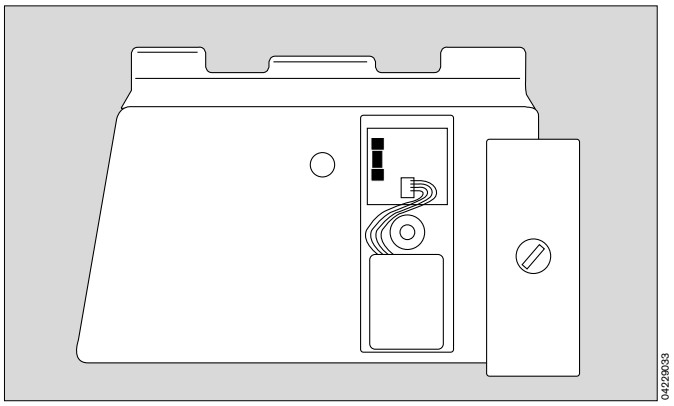
Replacing a fuse

If operation with NiCd or alkaline batteries is impossible (all ventilator functions have failed).

- Undo screw in cover of battery compartment (use coin) and remove cover.



- Take out defective fuse (use screwdriver to lift)
- Insert new fuse (1 A fast-acting IEC 127-2) into holder.
- Screw cover back into place.



In Case of Ventilator Malfunction

WARNING !

Never operate a ventilator if it has suffered physical damage or does not seem to operate properly. In this case always refer servicing to factory trained and authorized personnel.

WARNING !

Damage to the LCD

If, in case of damage to the ventilator, the glass of the LCD screen is broken, a liquid chemical may escape which must not be allowed to come into contact with the human body. Immediately wash affected skin areas with soap.

Troubleshooting

The following table is intended to assist in identifying and correcting conditions triggering an alarm.

Messages are listed in alphabetical order.

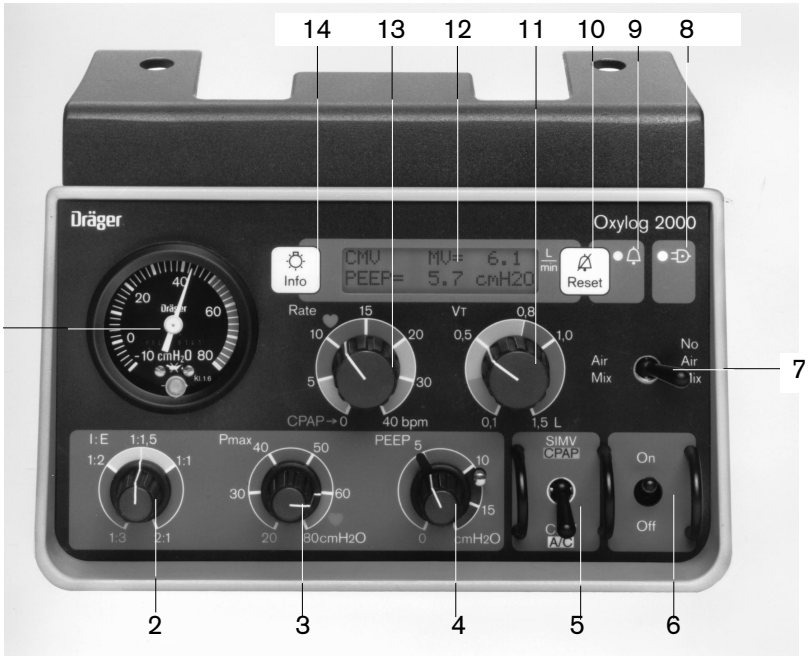
Condition / Message	Cause	Remedy
Apnea Alarm status light blinking, intermittent audible alarm.	Spontaneous breathing by patient has failed in CPAP mode.	Switch to CMV or SIMV.
Bat. discharged Alarm status light blinking, intermittent audible alarm. Ventilation stops.	Battery pack discharged, no external power supply.	Replace alkaline batteries or connect external power supply.
Change bat. Alarm status light blinking, single beep every 30 seconds. Display backlighting cannot be switched on.	Battery pack will be discharged within a few minutes, no external power supply connected.	Replace alkaline batteries or connect external power supply.
Charge NiCd Alarm status light blinking, single beep every 30 seconds, illumination for display cannot be switched on.	NiCd battery pack will be completely discharged within a few minutes, no external power supply connected.	Replace NiCd battery pack or connect power supply.
Check settings Alarm status light blinking, intermittent audible alarm.	Ventilator performance parameters have been exceeded. Effective flow is less than 4 L/min or greater than 60 L/min.	Correct the appropriate setting : e.g. Rate, V_T or I:E ratio.
Defective NiCd	Ventilator connected to external power supply, NiCd battery pack defective.	Replace NiCd battery pack.
Flow meas. INOP	Flow measurement defective. The measured values and alarms based on flow measurement are not valid!	Ventilation can be continued. **Observe patient carefully!** Call DrägerService after shutdown.
High rate	Hyperventilation, self-triggering. Measured frequency exceeds set rate by more than 50 %.	Correct settings, switch to CMV if necessary.
Leakage Alarm indicator flashes, intermittent tone sounds.	The measured expiratory minute volume is approx. 40 % lower than the inspiratory value. Leak in flow measuring hoses	Remedy leaks in patient system and possibly in tube. Use new flow measuring hoses.

Problem / Message	Likely Cause	Remedy
Main power down Alarm status light blinking, intermittent audible alarm.	Plug connection to external power supply does not make contact. Power supply unit or DC/DC converter defective.	Check plug connection or replace power supply unit or DC/DC converter. Press »🔔 **Reset**« to confirm. Ventilator continues operation with internal power supply.
NiCd discharged Alarm status light blinking, intermittent audible alarm, ventilation stops.	NiCd battery pack discharged, no external power supply.	Replace NiCd battery pack or connect power supply.
No NiCd charge **NOTE**: This message appears only in standby mode.	NiCd battery pack not installed, or alkaline battery pack installed, or ambient temperature outside range 0 to 35 °C when charging the internal NiCd battery pack, or internal fuse defective.	Charge NiCd battery pack at ambient temperatures between 0 and 35 °C.
No NiCd or bat.	Ventilator connected to external power supply, internal power supply not available.	Install fully charged NiCd or new alkaline battery pack.
Paw high Alarm status light blinking, intermittent audible alarm. The minute ventilation cannot be fully applied.	Airway stenosis. Ventilator circuit kinked. Reduced lung compliance. Inspiratory flow resulting from the setting for V_T, Rate and I:E too high. Patient "fighting" the ventilator. 80 cmH_2O set – for cardio-pulmonary resuscitation.	Clear airways. Ensure patient circuit is not kinked. Set higher P_{max} value. Set a longer inspiration time (smaller flow) with the »**I:E**« knob. Change ventilation pattern or ventilation mode. Sedate patient if necessary. No remedy required.
Paw low Alarm status light blinking, intermittent audible alarm.	Disconnection / leakage in patient connection, patient valve or ventilation circuit. Diaphragm incorrectly installed in patient valve or damaged. Leak in cuff.	Verify that connections are tight. Install diaphragm correctly or replace. Inflate cuff and check for leaks.

Fault / Message	Cause	Remedy
Supply press. low Alarm indicator flashes, intermittent tone sounds. Ventilation ceases.	O_2 cylinder empty, cylinder valve closed, probe not plugged into piped medical gas system.	Check gas supply in O_2 cylinder, connect to full O_2 cylinder. Open cylinder valve. Check gas pressure in piping system, ensure that system pressure is more than 2.7 bar. Push probe fully into wall socket.
XX XX XX XX XX **Ventilator INOP** Ventilation ceases! Alarm indicator lights up, continuous tone sounds. (XX = fault code)	Internal machine fault.	Switch off ventilator and disconnect from external power supply. Switch ventilator on again. If fault recurs: use alternative machine and call DrägerService.
Displayed measured value MV is implausibly high	Flow measuring hoses kinked. Water in flow measuring hoses.	Straighten out kink. Drain water from flow measuring hoses.
When switching on: no alarm tones of the same length to be heard.	Internal machine fault.	Switch ventilator off and on again. If fault recurs, use alternative machine and call DrägerService.
No message. External power supply connected, green LED does not light up.	Output voltage of power supply unit or DC/DC converter outside the range of 11 to 13 V.	Check plug connection or replace power supply unit or converter.
No message, no alarm, ventilator does not work.	No internal or external power supply available.	Fit fully charged NiCd battery pack or new alkaline manganese battery pack. Use alternative machine if applicable. Replace fuse, page 44.
No message. Continuous tone sounds for at least 7 seconds.	Sudden failure of the internal power supply when external power supply is not connected.	**Patient must immediately be ventilated by hand!** Connect external power supply. Check internal power supply.

What's What

Front View



1 Pressure gauge for airway pressure

2 Dial knob for ventilation time ratio »**I:E**«, infinitely adjustable from 1 : 3 to 2 : 1

3 Dial knob for limiting the airway pressure »**Pmax**«, infinitely adjustable from 20 to 60 cmH_2O; can also be set to 80 cmH_2O.

4 Dial knob for »**PEEP**«, infinitely adjustable from 0 to 15 cmH_2O, with lock for PEEP greater than 10 cmH_2O.

5 Switch for ventilation modes: **CMV / Assist Control** and **SIMV/CPAP**

6 ON/OFF switch »**0 / I**«

7 Selector switch for inspiratory oxygen concentration during CMV / A/C and SIMV
No Air Mix = 100 % O_2 by vol.
Air Mix = 60 % O_2 by vol.

8 Green power supply status light

9 Red alarm status light

10 »**Reset**« key, used to silence audible alarms for approximately 2 minutes and to clear alarm messages

11 Dial knob for tidal volume **VT**, infinitely adjustable from 0.1 L to 1.5 L

12 Liquid crystal display for minute ventilation, alarm and advisory messages

13 Dial knob for ventilation rate »**Rate**«, infinitely adjustable from 5 to 40 bpm.
0 bpm position used for »**CPAP**« ventilation mode

14 »**Info**« key to display additional settings and measured values, to switch on LCD backlighting for 30 seconds and to check all displays and the audible alarm

Rear View

1 Ventilator air intake and exhaust

WARNING !

Do not block air intake. Ventilator malfunction will result.

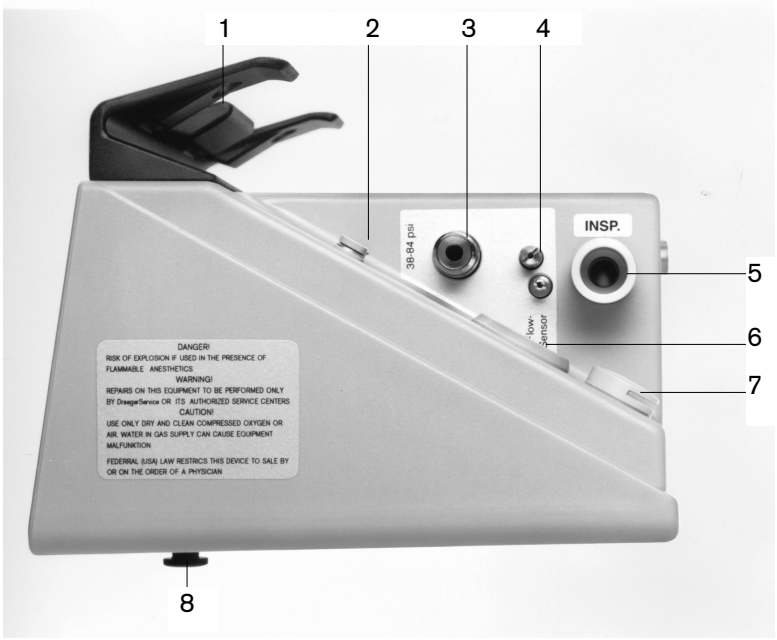
2 Air intake label

3 Main CAUTION/WARNING label

4 Identification plate

5 Compartment for internal power source, either rechargeable NiCd battery pack or battery pack with 6 AA alkaline batteries.

Right-Hand Side View


1
2
3
4
5
6
7
8
38-84 psi
INSP.
DANGER!
RISK OF EXPLOSION IF USED IN THE PRESENCE OF FLAMMABLE ANESTHETICS
WARNING!
REPAIRS ON THIS EQUIPMENT TO BE PERFORMED ONLY BY DrägerService OR ITS AUTHORIZED SERVICE CENTERS
CAUTION!
USE ONLY DRY AND CLEAN COMPRESSED OXYGEN OR AIR. WATER IN GAS SUPPLY CAN CAUSE EQUIPMENT MALFUNKTION
FEDERRAL (USA) LAW RESTRICS THIS DEVICE TO SALE BY OR ON THE ORDER OF A PHYSICIAN

MT 592-97

1 Bracket for securing ventilator in vehicles and for hanging unit from wall rails and horizontal tubes up to 38 mm (1.5 inch) diameter

2 Connector for external power supply (AC adapter unit or on-board supply with DC/DC converter)

3 Connector for O_2, 40 to 88 psi (= 2.7 to 6.0 bar)

4 Connectors for flow measuring hoses

5 Inspiratory port, 22 mm ISO taper

6 Beeper

7 Ventilator air intake and exhaust

WARNING !

Do not block air intake. Ventilator malfunction will result.

8 Ventilator feet, may also be used to secure the carrying strap

Technical Data

Ambient Conditions

For operation

Temperature	- 18 to 50°C (0 to 122°F)
Atmospheric pressure	600 to 1200 hPa
Relative humidity	30 to 95% relative humidity

For storage

Temperature	– 18 to 70°C (0 to 158°F)
Atmospheric pressure	600 to 1200 hPa
Relative humidity	10 to 95% relative humidity

Performance Data

Operating parameters

Control principle	Volume flow controlled, time cycled, volume constant flow chopper (microprocessor controlled)
	spontaneous breathing with integrated demand valve (also at elevated PEEP levels)
Ventilation modes	CMV / A/C, SIMV/CPAP
Ventilator rate	5 to 40 bpm ± 1 bpm infinitely adjustable
Tidal volume V_T	0.1 to 1.5 L infinitely adjustable
Setting tolerance at 10 cmH_2O airway pressure	± 10% of set value, 50 mL minimum
I:E ratio	1:3 to 2:1 ± 5% infinitely adjustable
Inspiratory pressure limitation P_{max}	20 to 60 cmH_2O ±10% infinitely adjustable; can also be set to 80 cmH_2O ±10% minimum ± 3 cmH_2O
PEEP	(0 +2) to 15 cmH_2O, infinitely variable
Expiratory minute ventilation MV with I:E = 1:1.5	min. 1.0 L/min max. 25.0 L/min
flow range for these MV-values	4 to 60 L/min

Characteristics for support of spontaneous breathing

Demand valve pressure trigger level	approximately - 1 cmH_2O
Max. demand flow (at -4 cmH_2O)	100 L/min
Sensitivity of synchronization	
for SIMV	4 L/min
for Assist/Control	3 L/min
Ventilator compliance	
with 1.5 m (5 ft) patient circuit	< 1.0 mL/cmH_2O
with 3.0 m (10 ft) patient circuit	< 1.2 mL/cmH_2O
Inspiratory resistance	< 6 $cmH_2O/L/s$
Expiratory resistance	< 4 $cmH_2O/L/s$
Dead space including flow sensor	approximately 28 mL

Measuring ranges

Pressure gauge	- 10 to 80 cmH_2O
Display accuracy	± 2 cmH_2O
Flow measurement range	2 to 120 L/min bidirectional
Max. permissible differential pressure for flow measurement	± 4 cmH_2O
Resistance of flow sensor	3 cmH_2O at 100 L/min
Measurement of minute ventilation	
Range	1 to 40 L/min
Accuracy (with 100% O_2 by vol., 1013 hPa, 20°C, 50% relative humidity)	
for 1 to 5 L/min	± 1 L/min
for 5 to 40 L/min	greater of ± 12% of measured value or ± 1 L/min
Patient connector	22 mm male ISO tapered connector
O_2 concentration of the ventilation gas (with O_2 supply)	
Switch set to »**Air Mix**«	
for MV less than 7 L/min	O_2 concentration can increase to 90 vol.%
for MV greater than 7 L/min	60 % O_2 by vol. ±10 %
Switch set to »**No Air Mix**«	100 % O_2 by vol.
Response in extreme conditions: when supply pressure is 10 bar (147 psi)	The applied tidal volume V_T increases additionally by approximately 5% of the set value

Alarms

Supply press. low	Alarm is activated when supply pressure drops below approx. 2.0 bar (29.4 psi).
Paw high	Adjusted with P_{max} knob. Alarm is activated when set value for Pmax is reached.
Paw low	Alarm is activated when a pressure buildup >10 cmH_2O is not achieved over a time of >20 s in CMV or SIMV mode.
Leakage	Alarm is activated when the expiratory tidal volume drops below 60 % of the inspiratory tidal volume. **NOTE**: The "Leakage" warning is not active in CPAP mode.
Apnea	Only active in CPAP mode. Alarm is activated if no change between inspiratory and expiratory breathing phase was detected.
Check settings	Alarm is activated when the inspiratory flow is above or below the range of 4 to 60 L/min due to the combination of parameters V_T, Rate, I:E . This alarm is important for the performance range of the flow valve. It does indicate an operator error does not need to be reset after corrections are made
Alarms	Are indicated visually and acoustically. The audible alarm stops automatically when an alarm condition has been corrected. The alarm message on the display must be cleared = press »🔔 **Reset**«.
Self-test	Is performed automatically at regular intervals during operation and in standby mode.
Volume of the alarm tone	75 dB(A) at a distance of 1 m

Operating Data

Gas supply

Supply gas	Oxygen for medical use, mixture of gases, medical air in emergencies
Quality of the supply gas	**WARNING !** **Always use medical grade oxygen or air that is dry and free from dust and oil. Contaminated gas may cause ventilator malfunction.**
Supply	From a pipeline system or from medical gas cylinders
Supply pressure	40 to 88 psi (2.7 to 6.0 bar) at 80 L/min
Gas cylinders and pressure regulators	**WARNING !** **Always use gas cylinders and pressure regulators that are officially approved and comply with all applicable safety regulations**.
Pressure regulators	must have a safety relief valve on the output side to limit output pressure to approx. 74 psi (5 bar) in the event of a defect.
Connection	DISS O_2 (male), may also be used for medical air in an emergency
Gas consumption for internal control	Approximately 1.0 L/min
with »**Air Mix**« selected	Approximately 50 % of the effective minute ventilation
with »**No Air Mix**« selected	Approximately 100 % of the effective minute ventilation
Typical time of operation at a minute ventilation of 10 L/min	
D-type O_2 cylinder	Approximately 32 minutes without mixing (No Air Mix) Approximately 64 minutes with mixing (Air Mix)
E-type O_2 cylinder	Approximately 56 minutes without mixing (No Air Mix) Approximately 112 minutes with mixing (Air Mix)

Electrical supply

Input voltage for Oxylog 2000	12 V ±1 V DC
Connection for external power supply 12 V / 24 V / 28 V DC	with DC/DC converter

Fuse (behind the cover of the battery compartment)	Fast-acting 1 A IEC 127-2
Current consumption when charging NiCd battery pack	
Ventilator OFF	300 mA (for 8 hours, then switches automatically to trickle charging)
Ventilator ON	530 mA
Current for trickle charge	30 mA
Permissible ambient temperature during charging	0 to 35 °C (32 to 95°F)
Time of operation (electrical)	
with internal NiCd battery pack	Max. 6 hours at 5 to 50 °C (41 to 122°F) Max. 3 hours at temperatures below 5 °C (41°F)
Alkaline (AA) batteries	Max. 4 hours at 5 to 50 °C (41 to 122°F) Max. 2 hours at temperatures below 5 °C (41°F) with typical settings
Protection class	Type BF (body floating)
Type of protection	IP 54 (splash-proof)
Protection class of AC adapter	II in accordance with IEC 601-1

DC/DC converter

Input voltage	10.5 V DC to 30.0 V DC
Output voltage	12.5 V DC (+0.05 V / –1.0 V)
Current consumption	700 mA to 1600 mA Protected by an internal micro-fuse (DIN 41 571 Part 2.0)
Temperature range	– 20 to +50 °C
Humidity	0 to 95 % relative humidity without condensation
Immunity to interference	Immune to electromagnetic interference in accordance with IEC 801-3 and VDE 843T3

Physical Characteristics

Dimensions (W x H x D)	215 x 120 x 205 mm (without handle)
Weight	4.3 kg (9.5 lbs)
NiCd battery pack	0.15 kg (5.3 oz)
Operating noise Sound pressure level	48 dB(A) at a distance of 1 m
Maximum height of fall	0.5 m (20 inch)

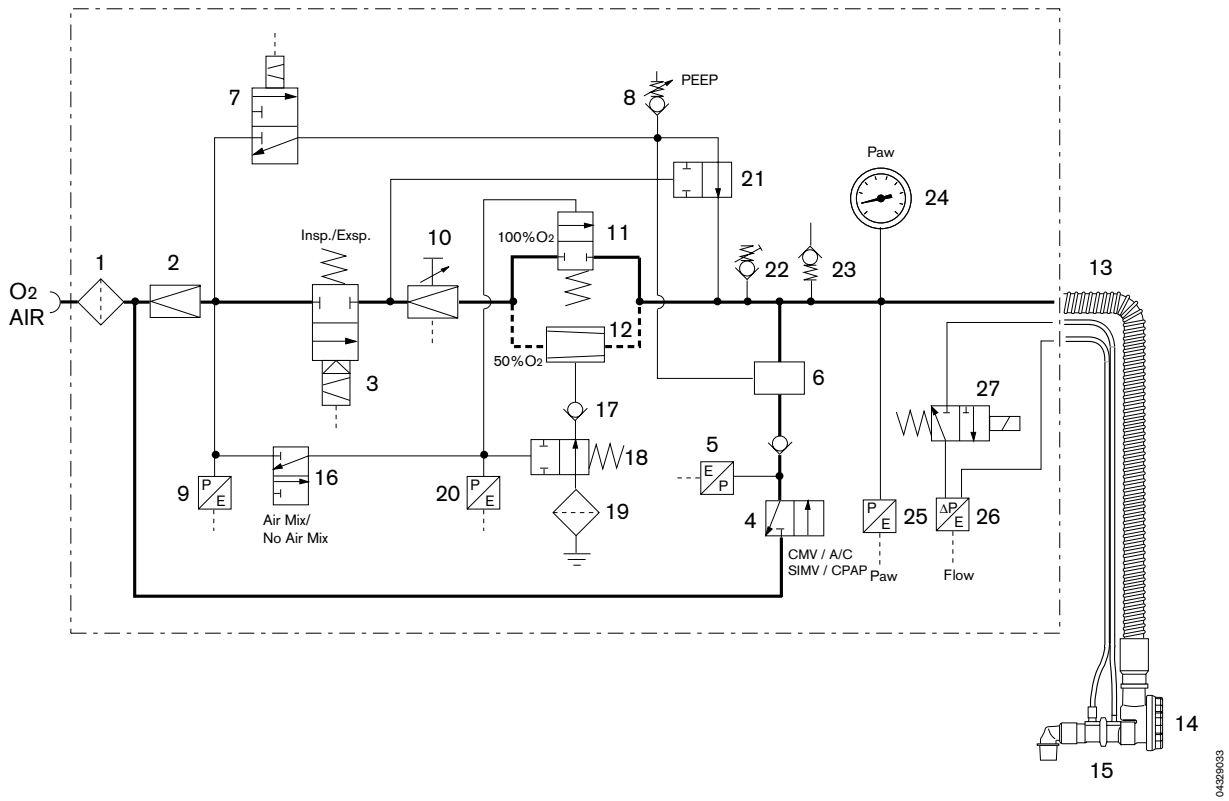
Materials used

Ventilator enclosure	Impact-proof acrylonitrile butadiene styrene (ABS)
Reusable patient circuit	silicone rubber
pressure sensing lines for flow measurement	silicone rubber
Flow sensor housing	polysulphone (PSU)
Flow sensor orifice membrane	stainless steel
Patient valve housing	polysulphone (PSU)
Patient valve diaphragms	silicone rubber
Membrane keypad on front panel	polyester membrane

Certificates

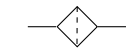
The Oxylog 2000 ventilator has been tested for electromagnetic compatibility according to the following standards and guidelines:

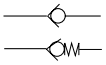
Electromagnetic emissions and immunity	IEC 601-1-2 ISO 10794/3 prEN 794-3 MIL-STD-461D/462 RE 101 / RS 101 / CS 101
Vibration and shock test	MIL-STD-810E
Flight approval	RTCA 160 C

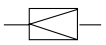


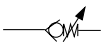
Theory of Operation

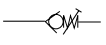
Symbols for Pneumatic Components

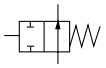

Filter

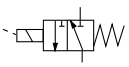

Non-return check valve


Pressure regulator


Pressure limiting valve, adjustable


Pressure limiting valve, non-adjustable


2/2-way valve, pneum. controlled


3/2-way valve, electrically controlled

Injector

Pressure gauge

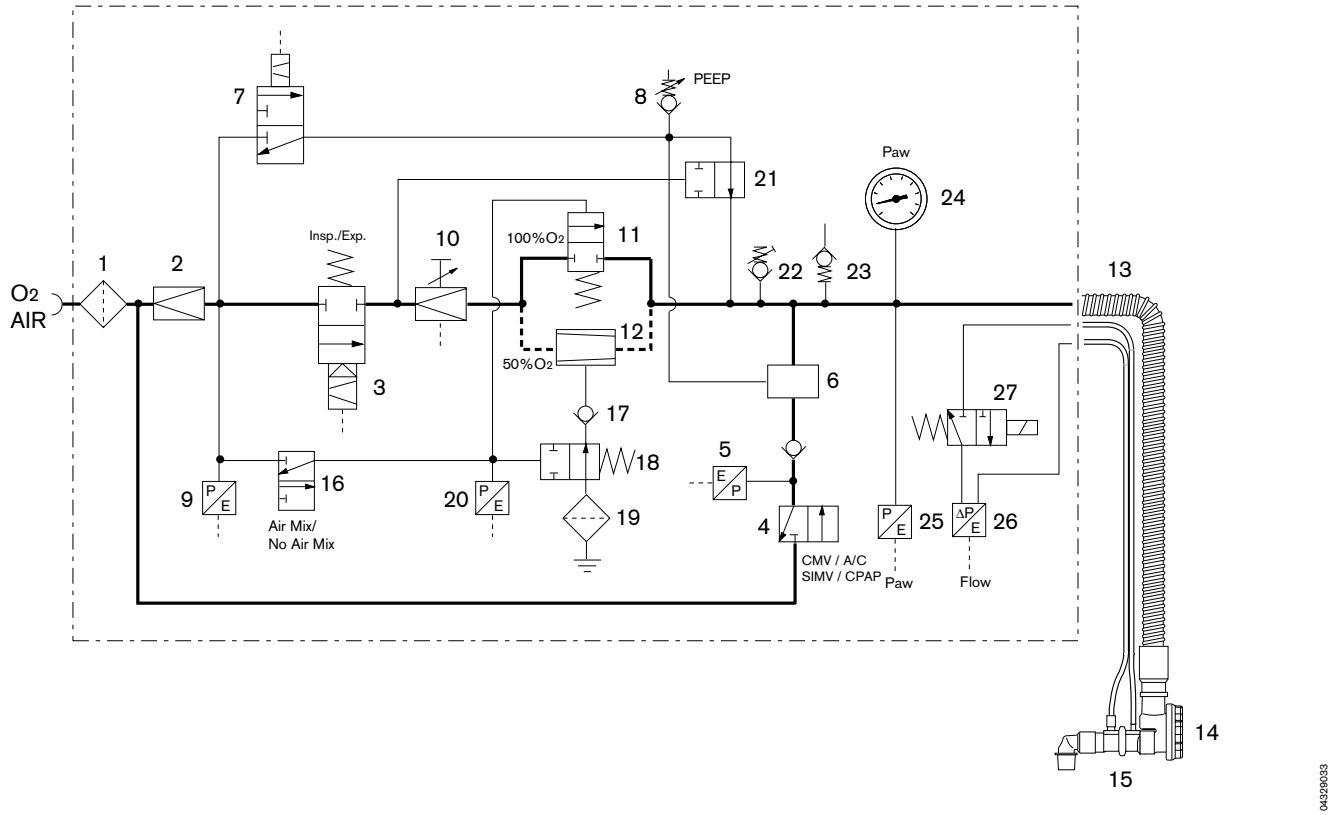
Pressure sensor

Differential pressure sensor

Gas Supply

The supply gas (O_2 or Air) is cleaned through filter **1** and reduced to a constant pressure with pressure regulator **2**. The 3/2-way magnetic valve **3** "Insp./Exp." opens inspiratory flow in the rhythm of the set ventilator rate. The electrically operated flow valve **10** controls the flow.

Supply gas is also routed via 3/2-way valve **4** »**CMV /A/C / SIMV/CPAP**« to demand valve **6**. System pressure is supplied at »**PEEP**« valve **8** via magnetic valve **7** and is monitored by pressure sensor **9**.



CMV / SIMV / A/C

Inspiration

3/2-way magnetic valve "Insp./Exp." **3** releases gas flow. Gas flow is controlled via electrically operated flow valve **10** and reaches the patient circuit either via 2/2-way valve **11** or via injector **12**. From there, gas is supplied to the patient wye passing through patient valve **14** and flow sensor **15**.

Dependent on the position of 3/2-way valve **16**, O_2 is supplied at 100% or is diluted to 60%. In order to perform blending, injector **12** draws ambient air via non-return valve **17**, 2/2-way valve **18** and filter **19**.

Pressure sensor **20** monitors position of »**Air Mix/No Air Mix**« switch.

The controlled 2/2-way valve **21** prevents inspiratory gas to reach the »**PEEP**« valve **8**. Pressure limiting valve **22** limits inspiratory pressure to a maximum value independent of P_{max} setting.

Additional ambient air can be drawn through auxiliary valve **23** in cases of failed gas supply. Airway pressure is measured at pressure gauge **24** and pressure sensor **25**.

Expiratory flow creates a proportional differential pressure at flow sensor **15** which is measured by differential pressure sensor **26** and used to determine minute ventilation.

Automatic zeroing of differential pressure sensor **26** is performed with 3/2-way valve **27**.

3/2-way magnetic valve **3** interrupts gas flow either in a time cycled fashion after inspiratory time (set via rate and I:E ratio) has elapsed, or pressure cycled after preset pressure P_{max} has been reached.

Expiration/PEEP

Gas in the patient circuit **13** is released via 2/2-way valve **21** down to the end-expiratoy pressure set with »**PEEP**« valve **8**. The patient can exhale through flow sensor **15** and patient valve **14** to ambient air. Patient valve **14** will maintain PEEP pressure set with »**PEEP**« valve **8**.

CPAP

3/2-way valve **4** releases gas flow to demand valve **6**. This function is monitored by pressure sensor **5**.

Inspiration/ Expiration

Demand valve **6** delivers an appropriate volume to the patient controlled by patient inspiratory effort. Gas delivery is stopped when the patient wants to exhale.

The demand valve maintains CPAP pressure in the breathing circuit using the PEEP/CPAP set with »**PEEP**« valve **8**.

Flow Measurement, Principle of Operation

The flow sensor is located at the patient connector end of the patient valve and both inspiratory and expiratory flow pass through it.
The flow creates a pressure drop in the sensor which is measured inside the Oxylog 2000 via two pressure sensing lines. The pressure drop is proportional to flow.
Expiratory minute ventilation is calculated from the measurement of expiratory flow and displayed.
Applied inspiratory volume is calculated from the measurement of inspiratory flow, it is then compared to expiratory volume and leakage is calculated and displayed.
Furthermore, measurement of inspiratory flow is used to synchronize mandatory ventilator breaths in SIMV mode.

Pressure Dependent Tidal Volume With Air Mix

Mixing of air and oxygen is performed using an injector, which draws additional air and creates a mixture of oxygen and air with a concentration of approximately 60%.
Due to the physics involved, the performance of an injector decreases with increasing back pressure.
With high airway pressures and »Air Mix« on, the set tidal volume V_T may be reduced and the resulting O_2 concentration may be increased.
Set and actually applied tidal volume V_T match at an airway pressure of 20 cmH_2O, the O_2 concentration is then approximately 60%. At higher airway pressures, set tidal volume V_T needs to be increased using measured minute ventilation as guidance.

Glossary

Air Mix	Blending of O_2 with ambient air (= approximately 60% O_2 by vol.)
CMV	**C**ontinuous **M**andatory **V**entilation Ventilation with mandatory ventilator breaths only
CPAP	**C**ontinuous **P**ositive **A**irway **P**ressure ventilator supported spontaneous breathing
CPR	Cardiopulmonary resuscitation
MV	Expiratory minute ventilation L/min
No Air Mix	No blending of O_2 with ambient air (= 100% O_2 by vol.)
P_{aw}	Airway pressure
P_{aw} high	Upper alarm limit for airway pressure
P_{aw} low	Lower alarm limit for airway pressure
PEEP	**P**ositive **E**nd-**E**xpiratory **P**ressure
P_{max}	Setting for airway pressure upper alarm limit "P_{aw} high"
SIMV	**S**ynchronized **I**ntermittent **M**andatory **V**entilation
I:E (ratio)	Ratio of inspiratory time versus expiratory time
*	Symbol for synchronized ventilator breath during SIMV
Reset	Key to silence audible alarms for 2 minutes and for resetting display messages after a condition has been corrected = acknowledge function
○ 🔔	Alarm status light, lights red during alarm conditions
○	External DC power status LED, lights green when external DC source is connected
⚠	Refer to Operating Instructions
	Protection class BF (body floating)

Item	Order No.
Ventilator Kit Oxylog 2000 USA	84 13 965
consists of:	
Oxylog 2000 Ventilator USA	84 13 960
NiCd rechargeable battery pack	84 11 599
shoulder strap	84 12 073
incl. accessories required for operation:	
Reusable patient circuit with pressure sensing hoses (silicone)	84 12 068
Patient valve	84 12 001
Flow sensor	84 12 034
Elbow	84 12 235
External Power Connections (for operation and charging):	
Adapter cable (cigarette lighter) with DC/DC converter for mobile on board supplies 12/24/28 V	84 12 071
or	
AC adapter for stationary operation	84 12 709
For functional tests	
Test lung	84 03 201
Optional Accessories	
Ventilator mounting bracket for use in ambulances	84 12 069
Corrugated breathing circuit (reusable)	84 02 041
Set of ET-tube adapters, adult sizes	84 03 685
Reusable patient circuit, 3 m (10 ft)	84 12 913
Battery holder (for 6 AA alkaline batteries)	18 35 505
Connecting cable for battery holder	84 12 072
Alkaline battery (AA size, 6 required)	13 35 804
Bacteria filter (single use item)	84 09 716

Name	Order No.
Carrying system 2000	AB 40 461
consists of:	
Carrying plate	
Cylinder holder, long or	
Cylinder holder, short	
Bag for accessories	
Patient circuit holder	

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These Instructions for Use apply only to
Oxylog 2000
with Serial No.:

If no Serial No. has been filled in by Dräger these Instructions for Use are provided for general information only and are not intended for use with any specific machine or device.

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